THE WORLD'S FARMERS GET TOGETHER

In an article under this caption in the *Review of Reviews*, March, 1927, Dr. Kenyon L. Butterfield, President, Michigan State College of Agriculture and Applied Science, after briefly summing up the aims of organizations, such as the International Commission on Country Life, American Country Life Association, International Conference on Agriculture, International Institute of Agriculture, International Plunkett Foundation, interprets these and similar organizations as part of the world-wide movement of farmers toward a "place in the sun," through co-operation. We quote Doctor Butterfield.

It is doubtful if people generally realize the importance of all of these endeavors. It must be remembered, however, that agriculture is not only the world's largest industry but that it is the most fundamental and vital. Until the time when the dim prophecies of science in the production of synthetic foods are realized, the farmers' contribution to society is a primary one.

Agriculture also involves the largest element of the world's population. Probably out of the billion and three-quarters of the people living in the world, at least one billion live and make their living on the land.

Again, the rural people of the world are rapidly coming into new power. This is perhaps best exemplified in Eastern Europe, where not only in Russia but all through the Balkans and in some other States, the peasants have virtual possession of the land that once belonged to great landlords. This new possession not only gives them great economic power but tremendous political prestige. Students of Russian history, for example, usually wind up by saying that, in the long run, the peasant will determine Russia's civilization and political policies.

The potential influence of the world's rural people in a controlled civilization is beyond imagination. If they have adequate intelligence and education, if they combine their forces nationally and internationally, they will have almost the decisive word with regard to national policies as well as concerning world co-operation and organization.

Furthermore, it is quite possible that we may develop a distinctive rural culture as a phase of advancing civilization. There are such things as a rural way of life, a rural mode of thought, and a specific rural community consciousness. If we can give to these local communities modern mechanical conveniences that reduce the severer aspects of toil, and keep the rural folk in touch with world influences through organization and continuing education, we may find that they will make a real contribution.

The influence of all of these international endeavors will be determined, in the long run, not merely by the significance of the industry of agriculture and of rural populations, but also by the importance which international co-operation is to play in the life of the world. There can be no doubt that the very existence of these international efforts in the rural field is an expression of a growing conviction of the importance and, indeed, of the absolute necessity of gaining the habit of international co-operation.

Agriculture is the great basic industry, says Dr. A. L. Dean, Director of the A. H. P. C. Experiment Station. If a nation is to prosper, its agriculture must be successful. Farming is not merely work, it is an enterprise. The day of the strong back and the weak head in agriculture has passed. To be successful in farming a man needs resourcefulness and the ability to work hard. Further than that, however, he needs knowledge of two kinds. First, he needs technical knowledge of agriculture, and second he needs business knowledge. No man can be a really successful farmer unless he can combine those two sorts of knowledge. The commonest shortcoming of farmers is lack of business sense and methods. They keep few or no accounts and have no real information on what operations are profitable and what ones are conducted at a loss. Every man who hopes to be successful on the land should get a good grounding in business methods and be familiar with the principles of accounting and of marketing.

—*The Extension Letter* (University of Hawaii).

. . . The poet's prayer, "Oh, wad some power the giftie gie us, to see oursels as ithers see us," was never more needed by any one than by the writer of bulletins. The man who can not write correct English does not see his ungrammatical constructions. The man who has a limited vocabulary does not realize the lack of clearness which results from his failure to use words carrying exactly the meaning or shade of meaning desired. The man whose style is verbose and redundant does not recognize the verbosity and redundancy of his writing. The man who is accustomed to long and complex sentences does not perceive the value of short, concise statements. Because he is unable to see the errors and faults of his work, he may be indifferent to suggestions of needed change, and resentful of changes made.

What is the remedy for the effect of these personal factors? Obviously, true perspective is the only remedy. The writer needs to stand off and study his product from new and different mental angles or viewpoints. First, he should put it away and let it get "cold". This may require ten days, or two weeks, or a month, depending on the person and on how completely he can forget it. At the end of this necessary period the writer can read his paper with something of the impersonal viewpoint from which others see it. Then only can he appreciably better it.—THE TECHNICAL BULLETIN, January, 1927.

—*Journal American Society of Agronomy.*

EDUCATION AND AGRICULTURAL PROMOTION IN JAPAN: IV. PROMOTION OF AGRICULTURE[1]

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A discussion of the agriculture of Japan without mention of its relation to the population would be grossly incomplete and unbalanced. Nothing catches the eye of a traveler in Japan quicker than the density of the population and the intensive cultivation of the farm lands. This is especially true in the well-beaten tracks of travel in the central and southern parts of Japan. In the northern third of the main island, Honshu, and in the island of Hokkaido evidences of congestion are not so apparent.

The total area of Japan proper is 147,652 square miles, which compared with the 114,400 square miles of the Philippines, shows that Japan is larger by about 13 per cent. But, Japan proper has a population of about sixty millions (59,736,704 persons in October 1925) or five times as many as the estimated twelve million of the Philippines. A large area of Japan is very mountainous, however, and not easily available for cultivation even under the intensive system of hand tillage practiced in Japan, so that the productive area is comparatively small. It is estimated that the cultivated area is 6 million cho, roughly corresponding to 6 million hectares. According to Professor Shimizu, of Keio University, as quoted by the Japan Yearbook for 1926, which I shall follow closely in this discussion, the density of population per square kilometer of cultivated area in different European countries compared with Japan is as follows:

Spain	90	England	226
France	108	Holland	273
Switzerland	168	Italy	305
Germany	185	Belgium	394
	Japan	969	

Japan stands far ahead of any European country, generally regarded as having a dense population. The present rate of increase in population is 1.3 per cent a year so that a greater load has to be carried by available resources from year to year. How this is met will be discussed presently.

The most generally raised crop of Japan is rice, this being the staple food of the people, and in going over the country one gets the impression that wherever rice will grow it is the crop planted. Of the total cultivated

[1]General contribution from the College of Agriculture No. 187.

area, more than half is devoted to rice and practically all of this is in paddy fields, upland rice not being raised, generally. It is estimated that half of the food consumed in Japan is rice. Secondary crops are barley, beans, wheat, rye, sweet potatoes, vegetables, and fruit.

Barley is now widely used as food, especially by the farming class. It is mixed with rice and the mixture is claimed to be more digestible and less conducive to causing beri-beri than rice alone.

A concise summary of the value of other agricultural crops is given in the Japan Yearbook of 1926:

> Among subsidiary farm crops there is perhaps nothing which plays so important a part in the Japanese kitchen as soy beans. The three daily articles of diet for all classes, viz., soy, miso and tofu are manufactured with this bean either in part or wholly. The "tofu" (bean curd) is one of the most popular articles of diet, being cheap and highly nutritious; the "miso" (a sort of macaroni) makes Japanese soup and is used in various other ways. The "soy" (a sauce) is indispensable in Japanese cooking. Then for extracting oils, as manure [fertilizer?], and food for horses beans are equally important. The supply being insufficient, a large quantity comes in from Manchuria and Korea. In Japan, Hokkaido is the principal center of production. Red beans, also very extensively produced in the northern island, are used for making confectionery. Peas and horse-beans, whether green or fully ripe, are cultivated as a second crop after rice and as a forerunner to rice, indigo, etc., on upland farms. Groundnuts (peanuts) are among the subsidiary farm produce that goes abroad, mostly to U. S. A. In Japan they are used by confectioners and also for pressing oil. Sweet potatoes occupy an important place as supplying a cheap substitute for rice for poorer folk, while the tubers are also used for making starch and some alcoholic drinks. Potatoes, first brought by the Dutch in 1589, remained comparatively neglected till about a few decades ago, when the importation of superior varieties drew the attention of farmers. The tubers go to Russian Siberia and Manila. The best potatoes come from Hokkaido.

INTENSIFICATION OF CULTURE

The farming population of Japan is estimated at 5½ million families, and the hectarage under cultivation at 6 million. This makes an average farm holding of a little more than one hectare to a family, which is so small that it calls for the most intensive type of culture.

Culture in the thickly populated localities near cities is done absolutely by human labor, although a farmer often has an ox to help him in plowing. In Hokkaido and northern Honshu, where the landholdings are larger, horses and American implements are extensively used.

Japan crops are heavily fertilized, especially with night soil, which is carefully stored and put back on the land. Of late years large quantities of commercial fertilizers have been imported to supplement natural manures. Other fertilizers used are compost, barnyard manure, fish guano, wood ash, and rice bran.

LAND RECLAMATION

It is estimated that there is still in Japan about two million hectares of land that could be reclaimed for tillage, and, by a rough estimate half of this could be converted into rice fields. The Government has embarked on

a program of reclaiming this land by reimbursing to the farmers 40 per cent of the cost of reclamation of areas of, at least, five hectares in size. If all this waste land were brought under cultivation, it is calculated that the food supply would be increased by 50 per cent.

LAND ADJUSTMENT

The Government has also undertaken the increase of acreage by adjusting the division of present farms, and enlarging the size of fields through elimination of unproductive boundary lines, such as dikes, mainly through consolidation by exchange of the land holdings of individuals situated in different localities. A force of experts is employed to carry this work of consolidation. Also, through this method a more rational division of the fields is made for purposes of irrigation and drainage. It is estimated that through this procedure there is effected an increase of 15 per cent in the yield of the same area of land.

The actual results brought about by the land reclamation and land adjustment systems have meant an increase of thirty thousand hectares of cultivated land in one year.

To further augment the acreage devoted to intensive cultivation, the Imperial family has decided to relinquish a number of its large estates in several regions, especially Hokkaido. These are cut up into small farms and sold to the people.

PRICE REGULATION

Japan realizes the dangers of possible famine attendant upon its insular location and protects itself by insuring the food supply of the nation. In order that the staple food of the country may continue to be grown in quantities closely approximating the needs of the country, the rice crop is protected as far as possible from the fluctuations of supply and demand. To this effect an act was passed in 1921 which aims to regulate the price of rice. Briefly, the working of the law is as follows: Whenever the price of rice tends to go below such a level as to make its production uneconomical, the government enters the market at a reasonable price and thus restores quotations to normalcy. Whenever the price tends to go up so as to threaten to disturb normal living conditions, the government opens up its stores and sells at a price that will reduce current prices to a reasonable level once more. The government has established granaries in four centers of population, in Tokyo, Osaka, Sakata, and Moji, with capacities ranging from 120,000 to 720,000 cavans.

The rice trade is to a large extent government controlled. Estimates are made of the incoming rice crop and this is balanced against the probable consumption. As the local production has not been equal to the demand since 1893 the difference is made up by importation, both from Japan's colonies, principally Korea and Formosa, and from abroad, French Indo-

China and Siam. The government aims to keep at all times a reserve for emergencies which it carries over from year to year.

A duty amounting to approximately one peso per cavan of clean rice is levied on imported rice.

RICE CONSERVATION

Japanese rice is much more palatable than the common rices. It partakes of many of the good features of glutinous rice without its defects. When cooked, it is soft but not sticky, it is savory and easily digested. Japanese are very fond of their rice and in Japan they pay about fifty per cent more for it than for the imported. Prosperous Japanese residing abroad import rice from Japan, paying a high price for it. The decrease in the local supply is made up by importation of cheaper kinds.

A considerable amount of rice is used in making *sake*, the common wine of Japan. It is estimated that about as much rice is made into *sake* as is imported from foreign countries, not including Japan's own colonies. The government is encouraging the production of this beverage out of materials other than rice. Investigators are working on possible substitutes. Should this move prove successful and the results of investigations be carried out in practice, it would release local rice in such quantities as to make further importation from foreign countries unnecessary.

AGRICULTURAL EXPERIMENT STATIONS

The agricultural development of Japan has received a decided impetus with the help of its experiment stations. The Central Experiment Station was first organized in 1890 as an experimental farm of the Department of Agriculture. Its field was the study of fundamental agricultural problems. Six branch stations were established in different regions to serve local agriculture. These were later abolished with the organization of prefectural experiment stations in the different prefectures, geographical units corresponding to our provinces. The Imperial Agricultural Experiment Station, while not organically at the head of the prefectural stations, maintains leadership over them through its central organization, more generalized field, better equipment and support, and personnel.

Probably the most important accomplishment of the stations has been the development of rice varieties well adapted to different sections of the country. These were largely tested and propagated in the prefectural experiment stations and distributed to their constituents. A similar line of work has been followed with other crops, but nowhere near so fully as with rice. In many instances new crops have been established in regions

through the agency of the local experiment stations. The exact working of the organization is succinctly described by Cramer[2]:

> The central organization is run by the government. It consists of a division of the Central Experiment Station in Tokyo with several branch stations in various regions of Japan; . . . In these central stations the work comprises the selection and further breeding of pure lines out of well known varieties; crossing and further breeding of hybrids; the attention is especially concentrated upon the making of new types and the first testing of them from a practical point of view. Before a new race is sent out, it is tested by this central organization during 3 years, to determine its value for practical agriculture. Formerly it used to be even 5 years, but it has been found not necessary to carry on the testing for such a long period. After this preliminary testing the seeds are handed over to the prefectural stations;... In the last mentioned stations the staff not only tests out the forms received from the central organization, but also it isolates, crosses, and purifies its own forms. The prefectural stations send out the rice seeds to the multiplication fields of the townships where the forms are further tested and from where they pass over into the hands of the common farmer. Till this last distribution all the seeds are distributed free of charge. It is estimated that, at present, 70 per cent of the seeds used reach the farmer by the way sketched above.

Next to the geographic extension of the rice growing regions of Japan and the improvement of plant stocks through scientific breeding methods, probably the most important work of the stations has been in the study of the manurial requirements of different crops, especially rice. Practically all important crops are fertilized, and the use of green manures has been generalized largely through the teachings of the experiment stations. In the past, only natural manures were used, but now larger and larger quantities of artificial fertilizers are employed. As the use of artificial fertilizers, being now relatively cheaper than commercial natural fertilizers, becomes more generalized, the experiment stations act as mentors in their proper use. Kato, quoted by Cramer, estimates an average expenditure for fertilizers, natural and artificial, in Japan as approximately 100 yen a hectare in 1923.

The experiment stations have also been instrumental in the improvement of native fruits and the introduction and acclimatization of new fruits and vegetables, as well as in the development of improved cultural methods including irrigation and drainage. The most conspicuous examples of introduced fruits now widely grown and in commercial quantities are apples and grapes.

FARM ANIMALS

The subject of farm animals, not being an intrinsic part of Japanese agriculture, can be discussed separately and will form the subject of the next article of this series.

[2] Cramer, P. J. S. 1926. Notes on Agriculture in Japan. Communications of the General Experiment Station for Agriculture No. 22, Buitenzorg, Java.

MAÑGABOL FISHERIES OF BAYAMBANG, PANGASINAN[1]

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WITH ONE GRAPH

No other municipality in the province of Pangasinan derives so much wealth from fisheries as does Bayambang. The municipality sets aside yearly, largely from income from fisheries, the sum of ₱25,000 for the local normal school and about ₱5,000 for the elementary schools. The fishing industry has made it possible for this town to be one of the most important educational centers of the province.

As far back as the revolutionary period (1899–1901), these fisheries played an important part in supplying fish to the soldiers of General Aguinaldo when they camped temporarily in Bayambang in their flight from the American Army[2]. The American Army stationed for several years at Bayambang after the insurrection was supplied with fish taken largely from the Mañgabol fisheries.

Among the important points considered in the present survey are:

(*a*) How much income is derived yearly by the municipality of Bayambang from its fisheries. (*b*) How the income from the fisheries compares with the income from all other sources. (*c*) What part of the income is set aside for schools. (*d*) Is the supply of fish in the fisheries becoming depleted? If so, what are the possible causes and remedies?

THE FISHERIES

Location

The fisheries are located in Lake Mañgabol which is in the southern part of Pangasinan. The lake extends over a portion of a marshy stretch of land in the southern part of Bayambang Municipality. According to the map of the Coast and Geodetic Survey, Manila, the region is situated

[1] Experiment Station contribution No. 450. Received for publication, March 22, 1927.

[2] VILLA, SIMEON A. The flight and wanderings of Emilio Aguinaldo from his abandonment of Bayambang until his capture at Palanan. *Translated by* J. C. Hixson in Philippine Education, **13**: 1926.

at about 15° 46′ north latitude. The marshy land and its vicinity is about 130 square kilometers in area, and is entirely inundated periodically by the Agno River. The fisheries can be reached on foot in about three hours by following the rough path along the Agno River bank from Bayambang southward.

History of the ownership of the fisheries

According to Mr. Rufino Tagulao, Municipal Secretary of Bayambang, the vicinity of Lake Mañgabol was a forbidding wilderness during the Spanish régime. It was inhabited by wild animals, such as deer, feral carabaos, monkeys, wild hogs, jungle fowls and other birds. Due to unrestricted hunting some of these species of animals have since disappeared. The writer saw a few monkeys and terrestrial and aquatic birds on his last visit.

The fisheries, according to Mr. Tagulao, were of no great importance prior to American occupation. This statement is probably true since the population at the time was small. These fisheries were the property of the central government (Insular Government) and were leased to Chinese fishermen. The products were marketed in Manila. On the establishment of Civil Government (1901) the ownership of the fisheries was transferred to the municipality of Bayambang, By this authority they were leased to private individuals, mostly Filipinos. The administration was rather lax and poor.

About 1912 the municipality declared the lake "Public Fisheries". It was then divided into lots and leased at public auction.

REVENUE DERIVED FROM THE FISHERIES

The population (1918 Census) of Bayambang is only about 15,000. However, according to the Executive Bureau, Manila, Bayambang has an annual income of ₱57,230.25 and is therefore a first class municipality. Of this income, ₱42,539.96 (average for a six-year period) or about 70 per cent of the gross revenue is derived from fisheries (table 1). Maximum

production was obtained in 1922 and 1923, but since then the income from these fisheries seems to be steadily declining (table 1 and graph).

TABLE 1

Yearly income from fisheries and gross income in Bayambang, Pangasinan

NAME OF FISHERY LOTS	INCOME FROM FISHERIES					
	1920	1921	1922	1923	1924	1925
	pesos	*pesos*	*pesos*	*pesos*	*pesos*	*pesos*
1. Banaoang na dueg...	9503.51	9503.51	13000.10	13000.10	8250.00	0.00
2. Manazan.....	6350.00	6350.00	13000.10	13000.10	8250.00	8250.00
3. Tubor.....	5440.00	5440.00	7250.04	7250.04	6000.00	6000.00
4. Mayor.....	3150.00	3150.00	8160.00	8160.00	6400.40	6400.00
5. Lepsag na Ilang.....	2944.50	2944.50	5102.50	5102.50	4602.25	4602.25
6. Mabalbalino.....	700.10	700.10	1350.05	1350.05	854.00	854.00
7. Amañgonan.....	290.00	290.00	405.05	405.05	850.25	850.25
8. Nagsañg.....	610.00	610.00	495.40	495.40	664.00	664.00
9. Nasiban.....	449.08	449.08	850.00	850.00	500.00	500.00
10. Bueleñg.....	457.80	457.80	602.00	602.00	702.50	702.50
11. Apalintogan.....	696.00	696.00	——	——	1250.00	1250.00
12. Tanoloñg.....	202.50	202.50	352.50	352.50	800.35	800.35
13. Maibpa.....	262.50	262.50	408.30	408.30	650.00	650.00
14. Anlañgigan.....	——	——	625.00	625.00	750.00	750.00
15. Buri Palms.....	260.00	260.00	212.54	212.54	301.12	301.12
16. Manamboñg.....	407.05	407.05	——	——	——	——
17. Pao.....	360.00	360.00	662.53	662.53	251.10	251.10
18. Talinoroñg.....	200.00	200.00	——	38.25	190.00	190.00
19. Camboca.....	101.00	101.00	101.50	101.50	241.10	241.10
20. Malimpec.....	162.50	162.50	——	——	——	——
21. Tococ.....	185.00	185.00	——	——	62.50	62.50
22. Ataynan.....	220.20	220.20	44.04	44.04	——	——
23. Bincoan Amamoan..	38.25	38.25	——	——	——	——
24. Lubir.....	——	20.00	67.50	67.50	79.00	79.00
25. Malimpec Dilay Vaca	——	——	——	21.05	85.00	85.00
26. Banaoañg na Pasin..	275.00	225.00	367.52	367.52	450.00	450.00
27. Langiran.....	——	——	——	——	——	——
1. Total income from fisheries.....	32364.99	32334.99	53056.67	53115.97	42183.57	42183.57
2. Income from other sources.....	14313.31	19687.44	18365.09	16189.20	15665.19	31853.36
Total from all.....	46678.20	52022.43	71241.76	69305.17	57848.76	74036.93

Sources of School Fund

It is believed that all of the funds needed for the support of the schools in Bayambang could be provided by fishery revenues. According to Mr. Edward Murphy, Division Superintendent of Schools for Pangasinan, Bayambang, through its Municipal Council, has obliged itself to set aside yearly the sum of ₱25,000 for the Bayambang Normal School and its train-

ing department. This sum does not include the amount needed for the maintenance of the elementary schools which runs to about ₱16,000 yearly. The total appropriation for schools in Bayambang during the school year 1926–1927 was ₱42,999. On the average, for a six-year period, since the time the municipality received considerable income from its fisheries, about 42 per cent of the total revenue or about 60 per cent of the income from fish has been devoted to schools. The graph shows the annual income of the municipality from fish as compared with that from other sources. It also shows the yearly expenses of the municipality for schools.

FIG. 1.—Income from fish and other sources and expenses for schools in Bayambang, Pangasinan.

MANAGEMENT OF THE FISHERIES

The fishery lots and their sale

Lake Mañgabol is divided into twenty-seven lots. Five of the most important of these lots had the following average income for a period of six years: (1) Banaoañg na Dueg ₱10,417.88; (2) Mananzan ₱9,283.33; (3) Tubor ₱5,930.00; (4) Mayor ₱5,903.00; and (5) Lepsag na Ilang ₱4,049.25, or a total of ₱35,583.89. The remaining lots contributed for the same period of time an annual total average of ₱7,209.98.

All of these lots are leased for a period of two years to private individuals. One lessee may occupy one or more lots at a time.

Fishing

The most common method of fishing in use throughout the year is by ordinary traps such as *tuel*, *pasabing*, *sicop* and other primitive means. Hook and line are used to a very limited extent. During the dry season, when the fish are caught primarily for market, fishing nets and some improved fish traps like the *talakeb* are used extensively.

During the dry season, which commences in November and ends in May, the water of the lake becomes shallow and many parts of the marsh dry up. Naturally, the fish move to the brooks and to other parts where the water remains deep. Here they gather in large numbers and then are led further down streams into the reservoirs, *bonoan*, which are inclosed by corrals. The number of fish collected in these *bonoans* is sometimes so great that one can easily catch fish barehanded. At this time the *bonoan* is said to "break" and is then ready for fishing.

When the day for fishing has been decided upon by the lessee, he invites, by distributing printed slips and posting placards in conspicuous places, the people in the nearby towns, Bautista, Malasiqui, San Carlos, Urbistondo and Camiling, to come and fish. Sometimes an agent or two are employed to carry out the advertisement from town to town so that many people will come to fish.

The day set for fishing is a big day for the lessee of the lot. From five to ten thousand people of both sexes and different ages come to fish, if the lot happens to be an important one. Every member of the fishing parties is assessed a certain fee and this constitutes at this time the only income of the lessee.

Fees and methods of fishing

The lot to be fished is previously subdivided into smaller lots each of which should be fished according to the lessee's instructions. There are special lots that are for groups of women and children. A lot is given a group of men with fishing nets or with fish traps, *talakeb*, and the members of this group are usually charged a fee of from one to two pesos each. Those who fish barehanded are usually charged from twenty centavos to one peso each, while children pay ten cents each. The whole day is devoted to fishing and each may catch as many as he can carry home.

After the first fishing, the lot is allowed to rest for some time to give the fish a chance to increase undisturbed. A lot may be fished as often as from two to three times during the season depending upon the supply of fish.

Quantity of fish caught

It has been estimated by Mr. Tagulao that the fish caught annually value not less than ₱100,000. Considering the amount paid into the treasury from the fisheries alone to be about ₱40,000, there is every reason to believe that the estimate is a fair one. It would require careful account-

ing and a very thorough survey to determine accurately the quantity and value of the yearly catch from the lake.

The most numerous fishes found in the lake are dalag, *Ophiocephalus striatus* Bloch; pantat (hito), *Clarias batrachus* (Bloch); and alalo (liwalo), *Anabas testudineus*. Semi-fresh water fishes are also found, among the most common are aliso or banak, *Mugil cephalus* Linn., and bolan-bolan, or buan-buan, *Megalops cyprinoides* Broussonet. Shrimps are also caught in large quantities during certain parts of the year. There are, according to the fishermen, about fourteen species of fish that are caught on a commercial scale in the lake.

Marketing

A great portion of the fish caught in the lake is sent to Manila (1918 Census), Tarlac and Pampanga markets, *via* the Manila Railroad. Bamboo baskets are used as containers. These are so well built that water does not leak out.

The nearby municipalities of Bautista, Malasiqui and San Carlos, also on the railroad line, are supplied with fish from the lake. Camiling, a town of Tarlac and south of Bayambang, is also supplied from these fisheries.

Added to these markets, there is the local market with several hundred students of the normal school to make local consumption of fish from the lake large.

POSSIBLE CAUSES OF DECREASE IN FISH SUPPLY

In the course of the survey, the following apparent causes for depletion of fisheries were found.

The fisheries are neglected. To quote the Municipal Treasurer: "The municipality does not spend anything on the lake for it is always rented by private persons who may in case of necessity spend something for improvement." Naturally, under this condition even the path to the fisheries is very poor and marketing fish involves much expense, consequently the prices are high.

The fishermen do not seem to co-operate in conserving the fish supply. Fish of any size are caught in any quantity and in any season, so that the very young fish and the mother fish are included indiscriminately in each haul. It is not strange then that the supply is steadily decreasing. Old men of the town frequently remark on this deplorable condition and practice.

The decrease in the fish supply is also attributed by the people to the effect of growing tobacco in the vicinity of the fisheries. The nicotine content of the stems left in the field after harvest leaches off into the water and affects the fish.

It is claimed that the periodical inundation of the lake by the Agno River causes the depletion of the fish supply of the fisheries. The effect

was indeed very deplorable in 1924 when the river cut a new course direct to the lake from Bautista. Now that a dike has been built across this new course extending along the southern bank of the river the danger from the overflow has been reduced.

A remedy for the situation

It is suggested that the municipal council or other body in authority should take immediate steps to remedy the situation.

To introduce additional species of fishes into the lake may prove profitable. Dr. A. W. Herre, of the Division of Fisheries of the Bureau of Science, has suggested that carp, *Cyprinus carpio* Linn., may be used for this purpose. The species has been found successful in stocking Laguna de Bay. The following is an item on this from one of the Manila daily papers:

> Carp fish, which originally came from Canton, China, is now abundant in Laguna Bay, particularly in waters near Santa Cruz and Los Baños, according to the Bureau of Science. The fish cost ₱5 a piece.
>
> According to Director Brown of the Bureau of Science, several carp fish were brought from Canton two years ago to the Bureau for experiment. They were let loose last year in Laguna Bay for breeding. Dr. Herre, chief of the fishery division of the Bureau, went to Laguna Tuesday and found that large number is being caught every day.

To stock Lake Mañgabol with carp, according to Dr. Herre, it is necessary that the municipality of Bayambang should defray the cost of fish used. The amount is not much considering the possible increase in the value of the fish supply of the lake when this project is accomplished.

SUMMARY

(1) The greatest resource of Bayambang are the Mañgabol fisheries which yield about ₱42,000 yearly or over 70 per cent of the total revenue.

(2) About 60 per cent of the income from fisheries is devoted to schools. This is about 42 per cent of the total revenue.

(3) The income from fish is steadily decreasing, probably due to unrestricted fishing employed by the private lessee of the fisheries of the lake.

(4) Protective measures in fishing and the introduction of carp into the lake may help improve the condition of the fisheries and their fish supply.

ACKNOWLEDGEMENT

The writer is greatly indebted to Dr. L. B. Uichanco of the College of Agriculture for his valuable suggestions and help in putting this paper in shape; to Dr. Herre of the Bureau of Science for suggestions and to his former students in biology in the Bayambang Normal School for their help in gathering some data.

COST OF RAISING PIGS FROM THE TIME SOWS ARE BRED UNTIL THE PIGS ARE WEANED[1]

VICTOR T. FELICIANO

The object of this experiment was to determine the cost of raising pigs from the time sows are bred until the pigs are weaned.

The work was begun in July, 1923, and ended in January, 1925, a period covering one year and six months. It was carried out in the Department of Animal Husbandry, College of Agriculture, Los Baños.

MATERIALS AND METHOD

Animals

There were seventeen sows used in this experiment, but of these only five completed the full period of observation. These five sows bear herd numbers 7, 207, 208, 210, and 309. Sow 210 farrowed twice, making 6 litters in all. In the tables this second litter is designated as "Sow 210A." Sow No. 309 is a native and happened to be the mother of sows Nos. 207, 208, and 210. These were Berkshire grades. There is no record as to the exact age of sow No. 309. Sows Nos. 207, 208, and 210 are sisters and were about three years and six months old when the experiment began. Sow No. 7 is the daughter of sow No. 208, and was two years and six months old. The sows were poor in condition when the experiment was begun. They were bred to a pure-breed Berkshire boar, so all the pigs used in the experiment had at least 50 per cent Berkshire blood.

Land and equipment

The area of land used in this experiment was approximately 5157 square meters. This area was divided into four different lots. Lot I had an area of 1787 square meters, was triangular in shape, and had no vegetation except some trees and bamboo which served as the natural shade and shelter of the animals placed in it. Lots II, III, and IV had an area of 1280 square meters, 1440 square meters, and 650 square meters respectively. These lots were planted with camote (*Ipomoea batatas* Linn.) and used as pasture for the animals. The number kept in each of the lots varied, owing to the difference in the time of farrowing of the sows. The topography of the land is hilly. Three compartments of the hog house; three troughs; two balances; and one empty cement barrel were used in this experiment.

[1] Thesis presented for graduation, 1925, with the degree of Bachelor of Agriculture, College of Agriculture, No. 251; Experiment Station contribution No. 451. Prepared in the Department of Animal Husbandry under the direction of Dr. B. M. Gonzalez.

Feeds and minerals

The feeds that were used were corn, copra meal, rice bran, and camotes. The camote was planted in lots II, III, and IV. Most of the corn used was raised in the Department of Animal Husbandry. The copra meal was bought from Oriental Oil Co., and Copra Milling Company in Manila. This copra meal was low in fat content. The rice bran used was bought in Sta. Rosa, Calauan, and Cabuyao and was of fair quality. Charcoal from wood and corn cobs and salt were given and also a mineral mixture.

Care and management

From the beginning of the experiment, sows which were bred were placed in lot I. The sows were kept there until well advanced in pregnancy. Besides the regular feed the sows were given every day fresh camote leaves gathered from lots II, III, and IV. The animals were supplied with clean fresh water all the time. They were also given charcoal and common salt once a week. Five to ten days before the animals were supposed to farrow, they were placed in a farrowing pen which had been prepared, cleaned, and disinfected. The sows were provided with clean bedding of dried banana leaves or excelsior, and clean troughs. The quarters were cleaned every day and disinfected with creolin solution once a week. In the farrowing pen the sows were also given camote vines and charcoal. Paddocks adjoined the farrowing pens. One or two weeks after they farrowed, when the small pigs were strong enough to run with the mother, they were put into one of the camote pasture fields. When the weather was bad the pigs were driven into the hog house.

When the pigs became more or less independent of the mother, they were weaned gradually. As soon as complete weaning was accomplished both the mother and the small pigs were weighed and turned back to the department.

During the progress of the experiment the animals were infested with lice most of the time. The infested sows were sprayed with a strong solution of creolin. The small pigs were bathed individually with 5 per cent creolin solution, and then a mixture of one part coconut oil and two parts kerosene was rubbed over the surface of the body with a piece of rag. This was found to be very effective.

Manner of feeding

The animals were fed twice a day. They were given a definite amount of the feed mixture each feeding. This was given in the form of thin slop. The amount given was as much as they could clean up in 10 to 15 minutes. Two to three sows were allowed to each trough.

The ration consisted of one part corn, two parts copra meal, and three parts rice bran by weight. The nutritive ratio of this ration is 1 : 6.28.

During the summer when the camote pasture in the three lots was almost exhausted the animals were given minerals mixed with their feeds, besides the charcoal and common salt which was given once a week. The formula of this mixture was as follows:

Bone black	10 grams
Sodium sulfate	10 "
Sulfur	5 "
Iron sulfate	5 "
Common salt	5 "
Potassium iodide	32.5 "
Powdered wood charcoal	32.5 "
Total	100.0 grams

This was added to every fifty kilograms of the mixed feed.

The animals were weighed once a week to determine the rate of growth. The initial weights of the sows were taken within twelve hours after they were bred. When the sows farrowed the mothers and the newly-born pigs were weighed within twenty-four hours. When the litters were completely weaned their final weights were also taken.

As the purpose of the experiment was to compute the cost of production, all work in connection with the animals was recorded. The cost of the feed consumed; the depreciation of the equipment used; and the rent of the sows and their depreciation; the rent of land, etc., were calculated on the basis of the average current price during the time of the experiment in a manner similar to Peña's[2] calculations.

The loss in weight of the sows was charged off at ₱0.60 per kilogram live weight and this was deducted from the income.

EXPERIMENT AND RESULTS

Experiment

Labor cost. The labor cost in this experiment was based on the wages of the hog man working in the department, who received ₱1.20 a day for ten working hours. The labor on the experiment was approximately one hour a day and the experiment lasted 561 days. The cost of labor was, therefore, ₱67.32.

Feed cost. The average current price for a kilogram of feeds, from July, 1923, to January, 1925, was: ₱0.079 for corn; ₱0.047 for copra meal; and ₱0.064 for rice bran.

Depreciation of the sows. As a general rule, sows lose in weight during the suckling period, hence the decrease in weight of the sows, as shown in table 1, was charged against the pigs at the prevailing price of pork in the College, which was ₱0.60 a kilogram live weight.

[2] Peña, Daniel B. 1924. The cost of raising swine under existing conditions in the College of Agriculture. The Philippine Agriculturist **12**: 469–480.

Land and house. The rent of the land was charged against the income. The rate of rent was 12 per cent per annum on the total value of the land used. The value of one hectare was ₱150.

The rent of the house was figured at ₱3 per annum for every compartment. The house was used very little, only for about three weeks at each farrowing.

Observations

The pastures of the Poultry-Swine Station of the Department were badly infested with kidney worms, ascaris, and lice. These parasites gave much trouble both to the animals and to the attendant. Many of the sows which we tried to use in this experiment did not catch the service of the boar.

Six litters out of five sows are included in these observations. The number of pigs born was 56, or an average of 9.3 pigs a litter. Fifteen pigs died before weaning, showing a weighted average mortality of 26.8 per cent. The number of pigs raised per litter was, therefore, 6.8 pigs. (See table 2.)

In general, the sows were not good breeders. The average birth weight of their young was .71 kilogram, which may be considered low. According to the records of Peña[3] the average birth weight of grade pigs in the College varies from 0.8 to 1.0 kilogram.

The pigs were weaned when between eleven and sixteen weeks of age. Their average weight then was 6.5 kilograms. The growth of the pigs was slow. This may have been due to the parasitic infestation of the animals (see table 3). The boar used in this experiment was quite advanced in age and this may have been partly the cause of the low fertility of the sows.

Results

Accounts. The expenditures may be summarized as follows:

Land, building, fences, and equipment:	
Rent of .515 hectare land (value ₱77.35) for 1½ years at 12 per cent per annum	₱13.92
Rent of 3 compartments of the hog house for 1½ years at ₱3.00 per annum	13.50
Interest on 418 meters of fencing (value ₱292.60) for 1½ years at 12 per cent per annum	52.21
Depreciation at 5 per cent per annum	14.63
3 feeding troughs at ₱2.00	6.00
	₱100.26
Stock:	
Interest on sows for 1½ years (value ₱251.70) at 12 per cent per annum	₱45.30
Depreciation sows (31.5 kilograms) at ₱0.60 per kilogram	18.90
	₱64.20

[3] Peña: *loc. cit.*

Feeds and drugs:	
290.82 kilograms of corn at average price of ₱0.0795 per kilogram	₱23.12
581.64 kilograms of copra meal at average price of ₱0.047 per kilogram	27.33
872.46 kilograms of rice bran at average price of ₱0.064 per kilogram	55.83
0.12 kilogram of bone black at ₱1.48 per kilogram	0.17
0.17 kilogram of sodium sulfate at ₱0.18 per kilogram	0.03
.08 kilogram of potassium iodide at ₱4.52 per kilogram	0.31
.085 kilogram of sulfur at ₱0.80 per kilogram	0.06
.08 kilogram of iron sulfate at ₱0.40 per kilogram	0.03
6 kilograms of common salt at ₱0.04 per kilogram	0.24
1 bottle of creoline	1.38
1 liter of coconut oil	0.80
1/3 can petroleum oil	0.70
	₱110.00
Labor:	
Cost of general labor	₱ 67.32
Total expenses	₱341.78

Cost of each pig. Dividing the total expenditures, ₱341.78, by the number of pigs raised, 41, the cost for each pig was ₱8.34.

Cost of feeds for each pig. Dividing the total cost of feeds, ₱110.00, by the number of pigs raised, 41, the cost of feeds for each pig was ₱2.68.

DISCUSSION OF RESULTS

The cost of feed per pig

The average cost per pig, when all expenses are included, was ₱8.34. Owing to the steady increase in the price of the feeding stuffs the cost of feeds per pig was quite high. Indirect factors affecting the high cost of feed was the poor harvest of 1924 and also the poor growth of the pigs.

Conditions affecting the cost of production

So far as the writer is able to estimate, other conditions affecting the cost of production are:

(1) A very large capital was invested in fencing, which was all charged to the six animals that farrowed and weaned their pigs within the period of observation. (2) The same was true for labor, supplies, etc., which were all charged against the sows that farrowed. (3) During the period of the experiment the price of feeds increased steadily. (4) The time of the experiment was prolonged owing to the shortage of materials, hence the cost of labor was increased considerably. (5) The fertility of the breeding animals used in the experiment was unusually low. (6) There was a high percentage of mortality caused by parasitic infestation, and the animals surviving had a stunted growth. All these conditions were not favorable to making a profit, and, on the whole, may be considered as abnormal.

According to the figures on table 2, it shows that the average gestation period of the sows was 114.6 days which is considered normal, and the average lactation period was 89.2 days or almost 13 weeks. Average grain

feed consumed by each sow during the gestation period was 130 kilograms and during the lactation period 164.9 kilograms for the sow and pigs.

The cost of the above was ₱8.25 for the gestation and ₱10.45 for the lactation period. (See table 4.)

SUMMARY

1. Under the existing conditions in the College of Agriculture when this experiment was carried out in the Poultry Swine Station the cost of feed per pig from the time the sows were bred until the pigs were weaned was ₱2.60.

2. It was found that the average cost of raising a pig to weaning when all expenses are taken into account was ₱8.34.

3. The average weight of the pigs at weaning age being 6.5 kilograms, the cost of producing a kilogram weight is therefore ₱1.28.

4. It was found that the average grain feed consumed by one sow during the gestation period was 130 kilograms, and during the lactation period, 164.91 kilograms. This includes the feed consumed by the suckling pigs.

5. Basing calculation on the current price of feeding stuffs used in this experiment, the average cost of feed consumed by a sow during gestation period was ₱8.25 and during lactation period ₱10.45.

TABLE 1

Showing weight of sows

SOWS	No. 7	No. 207	No. 208	No. 210	No. 309	No. 210	TOTAL WEIGHT
	kgm.	*kgm.*	*kgm.*	*kgm.*	*kgm.*	*kgm.*	*kgm.*
Initial weight.....	54.0	78.0	68.0	71.5	78.0	70.0	419.5
Weight after weaning.	52.0	73.0	65.0	60.0	71.0	67.0	388.0
Difference.....	2.0	5.0	3.0	11.5	7.0	3.0	31.5

TABLE 2

History of the litters

SOWS NO.	DATE MATED	DATE FARROWED	PERIOD OF GESTATION	NUMBER OF PIGS IN THE LITTER	NUMBER OF PIGS DEAD OR WEAK AT BIRTH	NUMBER OF PIGS REMAINING UP TO WEANING	PERCENTAGE PIGS BORN RAISED TO WEANING
7	July 19	Nov. 13	117	10	4	6	60.0
207	Jan. 18	May 14	117	8	1	7	87.5
208	Jan. 18	May 9	112	9	3	6	66.7
210	July 12	Nov. 3	114	12	3	9	75.0
309	Jan. 8	April 30	113	10	3	7	70.0
210A[a]	——	——	——	7	1	6	85.7
Total Average..	——	——	114.6	56	15	41	73.2

[a] Second farrowing of Sow 210.

TABLE 3

Showing the cause of death of the pigs, as found on post-mortem examination [a]

HERD AND BIRTH NO. OF PIGS	REMARKS
10 B	Died of ascaris and kidney worms
11 B	Died of general weakness
8 B	Died of weakness
9 B	Crushed by mother
8 B	Died of ascaris and kidney worms
7 B	Disappeared, probably eaten by mother
93 H	Died of ascaris
107 H	Died of ascaris and kidney worms
109 H	Died of ascaris and kidney worms
112 H	Died of ascaris and kidney worms
115 H	Died of general weakness

[a] Four other pigs were born dead and were not posted.

TABLE 4

Showing the cost of feeds consumed during gestation period and lactation

SOW NO.	LENGTH OF GESTATION PERIODS	TOTAL MIXED FEED CONSUMED DURING GESTATION	COST OF FEED CONSUMED DURING GESTATION	LENGTH OF LACTATION PERIOD	TOTAL MIXED FEED CONSUMED DURING LACTATION	COST OF FEEDS CONSUMED DURING LACTATION
	days	*kgm.*	*pesos*	*days*	*kgm.*	*pesos*
7	117	122.5	7.78	77	154.1	9.78
207	117	119.0	7.55	78	149.0	9.45
208	112	112.0	7.11	83	95.6	6.07
210	114	183.5	11.65	111	224.0	14.22
309	113	113.0	7.17	93	182.8	11.60
210A	———	———	———	93	184.0	11.58
Average..	114.6	130.0	8.25	89.2	164.9	10.45

TILLERING OF RICE[1]

DIONISIO CALVO

Rice varieties differ in their tillering power; some varieties produce more tillers than others. While it is supposed that the tillering power is a hereditary character, its expression is greatly modified by some external factors and by treatments, among the most important of which are the rate of seeding, the time of transplanting, the method of planting, the distance of planting, and the treatment of the soil. Hence, a knowledge of the tillering habits of the different rice varieties and of the factors affecting tillering is very desirable.

REVIEW OF PAST WORK

A number of investigators have worked extensively on rice characters, in general, as affected by some controllable factors. A few have studied the tillering habits of some cereals, such as wheat, rye, corn, and barley as affected by the rate of seeding and distance of planting, but no detailed systematic study on this single character of rice has been made in the Philippines.

Parr (1912) stated that the extent of tillering of cereal crops is inversely proportional to the amount of seeds sown within certain limits. He also stated that, without taking into consideration the fertility of the soil, the quantity of space allowed to each plant is the limiting factor of the plant's power to produce tillers.

Londsdale (1909) reports that "rice possesses the property of throwing out new shoots (tillers) when planted singly, but which does not occur to any great extent when planted in bunches varying from two to twenty seedlings". He claims that due to this practice of planting in bunches, most varieties lose their power of tillering, but this can be regained if the seedlings are planted singly year after year.

Jacobson (1916), in his work on the correlative character of the rice plant, found that varieties tillering freely produce more to the hectare than those that do not; and that when rice is transplanted, tillering is regulated by the number of plants set in the hill. He also found that tillering of the individual plant is negatively correlated with the size of grain and the number of grains to the panicle of the plant. That is, improved tillering habits of a rice plant are accompanied by a decrease in number of grains to the panicle.

[1] Thesis presented for graduation, 1926, with the degree of Bachelor of Science in Agriculture from the College of Agriculture No. 252; Experiment Station contribution No. 452. Prepared in the Department of Agronomy under the direction of Dr. Toribio Vibar.

Optiz (1905), in his investigations on rooting and tillering of grains, reports that, in general, the most productive varieties tiller more than those producing smaller yields. He also reports that wider distancing had the effect of improving the tillering habits of the plant. In this contention, he is supported by Hector (1921) who in his report on the work of the Department of Agriculture, Bengal, asserts that spacing has a great influence on the number of tillers and the number of grains to the tiller produced by the plant. Rodrigo (1924), in his investigation on the effect of spacing on tillering, concluded that, "the space allowed to each plant up to at least 40 centimeters each way was a criterion of the tillering power of the plant". He further concluded that as the space between the hills was increased greater variability in the number of tillers occurred and the number of tillers to the square meter diminished.

Jack (1921), in his preliminary report on experiments with wet rice in Krian, claims that tillers produced to the plant vary directly according to the space allowed a plant in transplanting, up to a spacing limit of 45.75 $\times$45.75 centimeters. Wider spacing than this tends to produce too much vegetative growth. Jack also asserts that as the number of plants to the hill is increased from one to four there is a fairly systematic increase in the number of tillers to the hill.

This same investigator reports that plants on good soil, transplanted but once, produce only one-fourth as much as when transplanted and split three times. Summers (1921), in quoting Graham and Jack, attributes the increased tillering of the transplanted rice to the increase in growth of the sub-aërial portion which is stimulated by the root pruning effects of transplanting.

Summers also asserts that the number of days to maturity is not a criterion of the tillering power of the plant. The same results were obtained by Jacobson (1921) with varieties maturing in less than 100 days.

Tiden (1911) reported that the tillering power of a variety fluctuates in different seasons, but that differences between varieties in the same class are smaller than differences resulting from weather conditions, distancing, and other similar factors.

OBJECTS OF THE PRESENT WORK

The general object of the present work was to make a preliminary report on the variability in the tillering power of different lowland varieties. The specific objects were: (*a*) To study the variability in tillering habits of several lowland rice varieties grown under Los Baños conditions; (*b*) to compare the tillering power of directly planted rice (*bacal* method) and the transplanted rice; (*c*) to determine the effect of spacing on the tillering power of rice; (*d*) to determine the effect of rate of seeding on the tillering power of rice; (*e*) to determine the effect of the age of seedlings at transplanting on the tillering power of rice.

TIME AND PLACE OF THE PRESENT WORK

The investigation was conducted during the College year of 1925–26. The experiments were performed in the rice paddies behind the U. P. Sugar Mill of the College of Agriculture.

MATERIALS AND METHODS

Study of the tillering power of different lowland rice varieties grown under Los Baños conditions

Thirty-two lowland rice varieties were sown July 12, 1925, in seed beds prepared in the local way. August 20–26, when about five weeks old, the seedlings were transplanted to rice paddies previously divided into lots, each variety occupying one lot. The hills were spaced at about 25×25 centimeters and one seedling was set to the hill. About one month after transplanting, the paddies were weeded once. Just before harvest time, the number of tillers to a plant of 100 hills from each variety were counted. The results obtained were tabulated and are on file in the College of Agriculture.

A comparison of the tillering power of directly planted rice (bacal method) and the transplanted rice, using the same variety, Apostol

Seeds were sown in seed beds previously prepared in the local way. When about four weeks old the seedlings were transplanted to the rice paddies. The hills were set at 25×25 centimeters; one seedling was planted to each hill. At the time of transplanting, seeds were planted directly in an adjoining rice paddy, setting the hills at 25×25 centimeters and planting about three seeds to the hill. When the seedlings were about two weeks old, they were thinned out to one seedling to the hill. When about ready for harvesting, the tillers of 100 hills from both the field transplanted and the one planted direct were counted and tabulated. Table 7 gives the average number of tillers of 100 hills from each paddy and the distribution of these hills according to the number of tillers to the hill.

To determine the effect of spacing on the tillering power of rice

Seeds were sown in seed beds previously prepared in the local way. When about four weeks old they were transplanted to a rice paddy which had been divided into four lots. Table 1 shows the distance of planting

in each lot, the number of plants to the hill, and the number of hills to the square meter.

TABLE 1

Spacing the experimental plots

VARIETY USED	PLOT NUMBER	SPACING	NUMBER OF PLANTS PER HILL	NUMBER OF HILLS PER SQ. M.
		cm.		
Apostol	1	12.5×12.5	1	64
	2	25 ×25	1	16
	3	50 ×50	1	4
	4	20 ×20	3	25

At harvest time, the number of tillers of 100 hills from each lot were counted. Table 7 gives the average number of tillers of 100 hills from each lot and the distribution of these hills according to the number of tillers to the hill.

To determine the effect of rate of seeding on the tillering power of rice, Apostol variety

The same procedure as used in experiment 3 was followed, except, that instead of varying the distance between the hills, the number of seedlings to the hill was varied, from one to four, using a distance of 25×25 centimeters in all cases. This difference in procedure is shown by table 6.

To determine the effect of the age of seedlings at transplanting on the tillering power of rice, Apostol variety

Seeds were sown in seed beds every two weeks, as follows: August 29, September 12, 26, and October 10. On October 24, or two weeks after the last sowing, all the seedlings were transplanted to a rice paddy previously divided into four lots, each lot not less than 42 square meters. In lot 1, eight weeks old seedlings were transplanted; in lot 2, six weeks old seedlings; and so forth. At harvest time, similar countings as in experiment 3 were made. The results are given in table 9.

Care of the cultures

Throughout the entire culture period, the different plots were treated practically the same. The irrigation water was maintained during the whole growing season.

EXPERIMENT AND RESULTS

Tillering power of lowland rice varieties

Table 2 gives a summary of the tillering power of 32 lowland rice varieties (actual results are on file in the College of Agriculture). It shows the average number of tillers for the 32 varieties and the distribution of these

varieties according to the average number of tillers to the variety. It shows the relative power of the different rice varieties to produce tillers.

TABLE 2

Showing the range of variability and the probable error of fruiting culms as affected by the number of tillers per hill

V	F	AVERAGE RANGE OF VARIABILITY	AVERAGE PROBABLE ERROR	VARIETY NUMBER[a]
fruiting culms		*fruiting culms*		
3.5	1	1–8	±0.1375	14
4.5	5	1–12.6	±0.1627	4–17–24–26–28
5.5	7	1–15	±0.1983	7–18–19–21–22–23–29
6.5	6	1–15.3	±0.2165	1–6–8–11–27–32
7.5	5	1–18	±0.2368	2–5–12–13–16
8.5	3	1–20	±0.2743	9–25–31
9.5	2	1–21	±0.2887	3–10
10.5	1	1–22	±0.3425	15

[a] 1. Azucena
2. Apostol
3. Apostol
4. Bal-latini
5. Balayang
6. Conner
7. Colocjo
8. Colocjo
9. Cochon
10. Cocong-oac
11. Cabarong
12. Calanay black
13. Calanay white
14. Daluson
15. De la Cruz
16. Hinaroan
17. Iroy
18. Kinastila
19. Lumbang
20. Macan Piña
21. Malabaco
22. Marintec
23. Mestizo
24. Minantica
25. Morado
26. Murmuray
27. Los Baños Rice No. 1
28. Payapay
29. Pulutan
30. Roxas
31. Sipot
32. Tapol

Field observations

The effect of weeds and insect enemies was very noticeable during the early growth of the young plants. The youngest leaves were the ones chosen for attack by insect enemies, especially the rice *Nymphalid*. In some plots the attack was more severe than in others. Most of the plants, however, were able to recover fully from the attack. With the wider spacing between the hills, the weeds grew more freely, but the weeding was easier. The date of flowering was a little earlier in the plots where the hills were set at 12.5×12.5 centimeters and 25×25 centimeters than where planted farther apart. The flowering was also a little earlier in the plots where the seedlings were transplanted at the age of 8 weeks and 6 weeks, than when either 4 weeks or 2 weeks old.

Comparison in the tillering power between directly planted and transplanted rice

Table 3 gives the average number of fruiting culms of 100 hills of the directly planted, and 100 hills of the transplanted rice, and the distribution of these hills according to the number of fruiting culms to the hill, as affected by the method of planting. It also includes the mean and probable error of the number of fruiting culms of each method of planting.

TABLE 3

Effect of the method of planting on tillering

NUMBER OF BEARING CULMS PER HILL	DIRECTLY PLANTED[a]	TRANSPLANTED[a]
2	1	
3	2	
4	19	3
5	22	3
6	18	7
7	17	16
8	9	15
9	5	14
10	3	6
11	1	10
12	1	6
13	1	6
14	1	3
15		5
16		4
17		0
18		2
19		
Mean and Probable error.....	6.18±0.142	9.84±0.227
Difference between the two means.....	3.66±0.2675	

[a] Using 25×25 centimeters spacing and one seedling to the hill.

Effect of spacing on tillering

Table 4 gives the distribution of the plants according to the number of fruiting culms of each plant as affected by the distance of planting. The average number of fruiting culms of 100 plants for each distance of planting, as well as their mean and probable error, are also given. The table shows

the effect of different spacing on the relative power of the plants to produce tillers.

TABLE 4

Showing the effect of spacing on the tillering power of rice

NUMBER OF BEARING CULMS PER HILL	12.5×12.5	25×25	50×50	C. METHOD
1				1
2	2			2
3	2	2	2	3
4	11	4	4	7
5	11	11	4	7
6	9	7	6	13
7	15	10	6	17
8	13	12	4	9
9	11	15	11	9
10	11	11	6	5
11	7	6	10	6
12	2	9	9	6
13	5	3	10	2
14	0	3	5	1
15	1	2	7	2
16		1	2	2
17		1	4	1
18		2	3	1
19		1	3	1
20			3	2
21			1	1
22				1
23				1
Mean and P. E.	7.62±0.1856	9.03±0.2067	11.26±0.2913	8.77±0.3058

Table 5 is a summary of tables 1 and 4. The number of fruiting culms to the square meter was computed by multiplying the actual number of fruiting culms to the hill by the number of hills to the square meter under the different spacings.

TABLE 5

Computed number of fruiting culms per square meter as affected by the distance of planting

SPACING OF HILLS	ACTUAL NUMBER OF TILLERS PER HILL	COMPUTED NUMBER OF FRUITING CULMS IN ONE SQ. M.
cm.		
20×20[a]	8.77	219.25
12.5×12.5[b]	7.62	487.68
25×25[b]	9.03	144.48
50×50[b]	11.26	45.04

[a] Three plants to the hill.
[b] One plant to the hill.

Effect of rate of seeding on tillering

The influence of the rate of seeding on the tillering power of the plant is shown in table 7. This table gives the distribution of the hills according to the effect of the number of the seedlings planted to the hill on the power of the plant to produce tillers. The table also includes the mean and the probable error of each rate of seeding. Table 8 is a summary of tables 6 and 7. The number of fruiting culms to the plant was computed by dividing the actual number of tillers to the hill by the number of seedlings to the hill. The number of fruiting culms to the square meter was computed from the number of tillers to the hill and the number of hills in one square meter.

TABLE 6

Seeding the experimental plots

VARIETY USED	PLOT NUMBER	SPACING	NUMBER OF PLANTS PER HILL	NUMBER OF PLANTS PER SQ. M.
Apostol	1	25×25	1	16
	2	25×25	2	32
	3	25×25	3	48
	4	25×25	4	64

TABLE 7

Effect of rate of seeding on tillering

NUMBER OF BEARING CULMS PER HILL	1 PER HILL	2 PER HILL	3 PER HILL	4 PER HILL
2	2			
3	2	1	2	
4	5	2	1	1
5	6	6	2	2
6	11	7	3	3
7	9	7	7	8
8	16	9	7	7
9	8	9	6	6
10	9	8	9	7
11	6	15	17	5
12	7	6	11	10
13	5	7	8	14
14	5	6	6	6
15	2	7	7	8
16	3	3	3	5
17	1	3	2	2
18	1	1	1	2
19	1	1	2	4
20	0	2	2	3
21	1		1	1
22			1	1
23			2	1
24				1
25				2
26				1
Mean and Probable error	9.17 ±0.256	10.48 ±0.254	11.66 ±0.246	12.81 ±0.3251

TABLE 8

Computed number of fruiting culms per plant and per square meter as affected by the rate of seeding

RATE OF SEEDING	ACTUAL NUMBER OF TILLERS PER HILL	RELATIVE	COMPUTED NUMBER OF TILLERS PER PLANT	RELATIVE	COMPUTED NUMBER OF TILLERS PER SQ. M.
plants					
1	9.17	100	9.17	100	146.72
2	10.48	114.28	5.24	57.14	167.68
3	11.66	127.15	3.88	42.31	186.56
4	12.81	139.69	3.20	34.89	204.96

Effect of age of seedlings at transplanting on tillering

Table 9 shows the effect on tillering of age of seedlings at transplanting. The mean and the probable error of the number of fruiting culms in a hill for the different times of planting are also in the table. The data show the effect of age of seedlings at transplanting on the relative tillering power of the plants.

TABLE 9

Effect of age of seedlings at transplanting on tillering

NUMBER OF BEARING CULMS PER HILL	8 WEEKS OLD	6 WEEKS OLD	4 WEEKS OLD	2 WEEKS OLD
1				
2				1
3				2
4	2	1	3	7
5	3	2	3	16
6	4	3	7	16
7	7	8	16	16
8	12	7	15	6
9	10	8	14	8
10	14	6	6	9
11	11	9	10	5
12	9	8	6	5
13	7	9	6	4
14	4	7	3	2
15	5	7	5	1
16	4	6	4	1
17	3	6	0	1
18	3	4	2	
19	1	4		
20	1	3		
21		1		
22				
Mean and Probable error	10.81 ±0.2345	11.90 ±0.284	9.84 ±0.227	7.97 ±0.208

DISCUSSION OF RESULTS

Tillering power of lowland rice varieties

It is shown in table 10 that, under a given set of conditions, rice varieties differ in their tillering power. Some varieties produced more tillers than others. The number of fruiting culms to the plant ranged from 3.73 for Daluson to 10.84 for De la Cruz, and as high as 16.68 for Roxas. The excessive number of tillers of two varieties, however, 16.68 for Roxas and 15.47 for Macan Piña, may be considered exceptional since they were the only two varieties that greatly exceeded the average number of fruiting culms of the varieties studied, as shown in table 2. Upon closer examination of these two exceptional varieties, it was found that the fruiting culms tended to branch, so that where there should have been only one tiller, there were actually two or more. These varieties also were found to measure below the average height of the rice plant and to belong to the early maturing class. The 25×25 space allowed to each hill was probably favorable in these two cases; this coupled with the fact that ample time for development was allowed, induced the plants to produce an excessive number of tillers. These findings seem to agree with the assertion of Summers (1921) that when the plants are set rather far apart, three sets of tillers may arise, the last sets producing the smaller panicles.

Of the remaining 30 varieties, six, Bal-latini, Daluson, Iroy. Minantica, Murmuray, and Payapay, were found to fall below the average; eighteen, Azucena, Balayang, Conner, Colocjo, Cabarong, Calanay black, Calanay white, Hinaroan, Kinastila, Lumbang, Malabaco, Marintec, Mestizo, Los Baños Rice No. 1, Pulutan, and Tapol, to fall near the average; six, Apostol, Cochon, Cocong-Oac, Morado, Sipot, and De la Cruz, to fall above the average. In general, the short varieties appeared to tiller more than the tall varieties. Since all of the varieties from the time of planting to harvesting were treated in the same manner, it must follow that the significant differences in the tillering power between the varieties must have been due to some hereditary factor. Tillering, then, must be considered as a varietal characteristic, although its outward expression may be greatly modified by environmental factors as will probably be shown in the subsequent experiments.

The higher the average number of fruiting culms to the hill, the greater was the range of the number of fruiting culms and the larger also the probable error, as shown in table 10.

Among the varieties that produced fewer than 5 tillers to the plant, were Daluson, Murmuray, Minantica, Bal-latini, Iroy, and Payapay; around 5-6 tillers, were Kinastila, Malabaco, Lumbang, Colocjo, Mestizo, Marintec and Pulutan; 6–7 tillers, were Azucena, Los Baños Rice No. 1, Conner, Tapol, Cabarong; 7–8 tillers, were Balayang, Hinaroan, Calanay black, and Calanay white; 8–11 tillers, were Sipot, Cochon, Morado, Cocong-Oac, Apostol and De la Cruz.

TABLE 10

Distribution of varieties according to their average number of tillers per plant

V	F	VARIETY NUMBERS
3.5	1	14
4.5	5	4–17–24–26–28
5.5	7	7–18–19–21–22–23–29
6.5	6	1–6–8–11–27–32
7.5	5	2–5–12–13–16
8.5	3	9–25–31
9.5	2	3–10
10.5	1	15

Mean = 6.78 $\pm$0.0118.

Date of flowering

The date of flowering was a little earlier in the plots where the hills were set at 12.5×12.5 and 25×25 centimeters, than where the hills were set at 50×50. The date of flowering was also earlier in the plots where the seedlings were transplanted when six or eight weeks old than when two or four weeks old. The range of the flowering season was longer where the seedlings were six or eight weeks old when transplanted, than when two or four weeks old. It was observed that when the range of the flowering season was longer, vegetative growth was more vigorous and production of tillers was greater than when the range of flowering season was shorter.

Effect of the method of planting on tillering

In table 3 it is shown that plants grown from seedlings transplanted from the seed bed to the field produced more tillers than when the seeds were planted directly in the field. In the transplanting method the average number of tillers for 100 plants was 9.84 $\pm$ 0.227, while in the direct planting method, the average number of tillers for 100 plants was only 6.18 $\pm$ 0.142, a difference of 3.66 $\pm$ 0.2675. The transplanting method produced 59.2 per cent more tillers than the direct planting method. These results agree with the assertion of Jack (1921) that the transplanted plant produced more tillers than the directly planted plant. He also stated that on good soil, seedlings transplanted but once produced only one-fourth as much as when transplanted and split three times. Summer (1921) in his paper on the tillering of Ceylon rice says that Graham and Jack attributed the greater tillering power of transplanted rice to the root-pruning effects of transplanting and that the "shock" produced stimulates the growth of the subaërial portion of the plants, resulting in an increased number of tillers.

Effect of spacing on tillering

In table 4 it is shown that as the distance between hills varied, the number of fruiting culms to the hill directly varied. It may be seen that

as the hills were set further apart the plants produced more tillers to the hill. At a distance of 12.5×12.5 centimeters, the average number of tillers was 7.62 ± 0.18; at 20×20, with three seedlings to the hill, which is the common method of planting, the average number was 8.77 ± 0.30; at 25×25, with one seedling to the hill, 9.03 ± 0.20; and at 50×50, 11.26 ± 0.29. These results concur with the statement of Parr (1912), that the quantity of space allowed to each plant is the limiting factor of the power of the plants to produce tillers. They also agree with the findings of Jacobson (1917), of Jack (1921), and of Rodrigo (1924).

Although the number of fruiting culms to the plant increased relatively as the space was made wider, as shown in table 11, this increase was not in proportion to the increase in space. So that, when the number of tillers to the square meter was computed, as shown in table 5, the 12.5×12.5 centimeters distancing had twice as many tillers as the 25×25 centimeters spacing and about five times more than the 50×50 centimeters spacing. However, it was found by Rodrigo (1921), and in this he is supported by Jacobson (1917), that the number of fruiting culms to the unit area was not an indication of higher productivity of a given area. On the other hand, Jacobson (1916) found that tillering, the number of grains per panicle, and grain size were compensating characters. That is, increased tillering of the individual plant was accompanied by decreased number of grains to the panicle. It would not be incorrect, therefore, to infer that the comparatively smaller number of fruiting culms per unit area in the 25×25 spacing was compensated for by larger grain size and increased number of grains per panicle.

TABLE 11

Showing the relative stooling power as affected by the distance of planting

VARIETY NAME	COMMON METHOD	12.5×12.5 *cm.*	25×25 *cm.*	50×50 *cm.*
Apostol	100	86.88	102.96	128.39

Effect of rate of seeding on tillering

As table 7 shows, the rate of seeding affected the number of fruiting culms produced to the hill. There was a fairly regular increase in the number of fruiting culms to the hill, as the number of seedlings to the hill was increased. The average number of fruiting culms for one seedling to the hill was 9.17 ± 0.25, for two seedlings to the hill, 10.48 ± 0.25, for three seedlings to the hill, 11.66 ± 0.24, and for four seedlings to the hill, 12.81 ± 0.32. This increase, however, was not in proportion to the increase in number of seedlings, as shown in table 8. When the seedlings were increased from one to two, a 100 per cent increase, the increase in percentage of the number of fruiting culms was 14.28; increased from two to three seedlings, the

increase was 12.87 only; increased from three to four seedlings, the increase was 12.54 per cent. On the other hand, the seedings reduced their tillering power by about 43 per cent when the number of seedlings to the hill was increased from one to two; 12 per cent when the seedlings were increased from two to three; and about 8 per cent when increased from three to four. These findings agree with the report of Londsdale (1909) that rice possesses the property of tillering when planted singly, but this does not occur to any great extent when planted in bunches, varying from two to twenty seedlings. In general, the results show that increasing the number of seedlings to the hill from one to two or more, reduced the tillering power of the plant by about 50 per cent. This loss in the tillering power of the plant can be attributed ultimately to the limited space allowed the plant for development. Increasing the number of seedlings to the hill from one to two is equivalent to reducing the space of the individual plant from 25×25 centimeters to 12.5×12.5, which distance in the present experiments was found to be insufficient for the plants to show their tillering power properly.

Effect of the age of transplanting on tillering

As shown in table 9 the tillering power of the plant was affected by the age of seedlings when transplanted. In the case of Apostol rice variety, seedlings transplanted when four weeks old produced fewer tillers than when planted at six or eight weeks old; seedlings planted at six weeks old produced more tillers than those eight weeks old; and the seedlings that were two weeks old gave the poorest tillering. In general, the results show that the tillering power of the plant increased with age of the seedling up to six weeks, when transplanted older than this, the power diminished.

The average number of tillers of 100 plants, transplanted when the seedlings were two weeks old, was 7.97 ± 0.208; when four weeks old, 9.84 ± 0.227; when six weeks old, 11.90 ± 0.284; and when eight weeks old, 10.81 ± 0.234. It may be stated, therefore, that under Los Baños conditions, using one seedling to the hill and spacing at 25×25, it is more advantageous to transplant the seedlings when six weeks old, than when eight, four, or two weeks old, because transplanting them at the age of six weeks the greatest number of tillers was produced, and it is known (Jacobson, 1921) that yield and tillering are decidedly positively correlated.

When six weeks old, the seedlings were strong enough to withstand the "shock" of transplanting and at the same time young enough to induce the sub-aërial portion to produce new tillers. The eight-weeks old seedlings were mature enough to withstand the "shock" of transplanting, but a little too old to allow the plant to produce many new tillers, as evidenced by the fact that the plants began to flower scarcely three weeks after planting. The two weeks old seedlings were too young to withstand the root-pruning

effects of transplanting, and their energy was spent in recovering from the "shock", so that comparatively few tillers were capable of developing. The behavior of the seedlings, however, when transplanted may be affected by how thickly the seeds were sown in the seed bed. If the seeds are sown thinly in the seed bed, the seedlings will grow faster than when the seeds are sown thickly. This being true, the four weeks old seedlings may be developed enough to withstand the "shock" of transplanting and at the same time produce many tillers, while the six weeks old seedlings may be too mature to be able to do so. It may be mentioned in this connection that no comparison was made as to whether the seedlings in this experiment were more thickly sown than is ordinarily done in this locality.

SUMMARY OF CONCLUSIONS

A study was made on the tillering power of 32 varieties of rice and on the effect of spacing, method of planting, rate of seeding, and age of seedlings at transplanting on tillering. The following conclusions may be drawn from this study:

1. Different lowland rice varieties vary in their tillering power. The average number of fruiting culms per plant ranged from 3.73 ± 0.13 for Daluson to 16.68 ± 0.57 for Roxas.

2. Varieties Daluson, Murmuray, Minantica, Bal-latini, Iroy and Payapay produced below 5 tillers to the plant; varieties Kinastila, Malabaco, Lumbang, Colocjo, Mestizo, Marintec, and Pulutan produced from 5 to 6 tillers to the plant; Azucena, Los Baños Rice No. 1, Conner, Tapol and Cabarong, from 6 to 7 tillers; Balayang, Hinaroan, Calanay black and Calanay white, 7–8 tillers; while Sipot, Cochon, Morado, Cocong-Oac, Apostol and De la Cruz, all produced from 8–11 tillers. Roxas and Macan Piña were two exceptional varieties, each producing more than 15 tillers to the plant.

3. The higher the average number of fruiting culms to the hill, the greater was the range of variability of the number of fruiting culms and the larger, also, the probable error of the average number of fruiting culms.

4. Transplanting seedlings when four weeks old and using one seedling to the hill produced 9.84 ± 0.22 tillers to the hill, while direct planting the seed and keeping one seedling to the hill produced 6.18 ± 0.142 tillers to the hill.

5. The greater the space allowed to each plant up to a distance of 50×50 centimeters the larger was the number of fruiting culms produced to the plant. A distancing of 12.5×12.5 centimeters had an average of 7.62 ± 0.18 tillers to the plant; a distancing of 50×50 centimeters produced, an average of 11.26 ± 0.29 tillers to the plant.

6. The number of fruiting culms per unit area diminished as the spacing was made greater.

7. As the number of seedlings was gradually increased from one to four, there was a regular increase in the number of tillers produced to the hill.

8. The number of fruiting culms to the plant greatly diminished as the number of seedlings to the hill was increased from one to four. Using one seedling, 9.17 ± 0.25 tillers to the plant was obtained; using four, 3.20 tillers were produced to the plant.

9. Under Los Baños conditions and using Apostol variety, the older the seedlings were, up to six weeks, the larger was the number of tillers produced to the plant, older than this the tillering power diminished.

10. Using one seedling to the hill and a spacing of 25×25 centimeters, six weeks old seedlings produced 11.9 ± 0.28 tillers to the plant, while two weeks old seedlings produced only 7.97 ± 0.20 tiller to the plant.

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NOTE: THE 1927 LIVE STOCK FAIR[1]

The Live Stock Fair, held in conjunction with the Philippine Carnival of 1927, was the second Insular Stock Fair ever held in the Islands. It was generally acclaimed to be the most important of the industrial and educational features of the carnival. About ₱12,000 and a large portion of the Carnival City with three buildings covering an area of 2,240 square meters were allotted for the live stock exhibits. Dr. Victor Buencamino, a practicing veterinarian and animal importer in the city of Manila, was the organizer and general factotum of the fair. To him should go a great deal of the credit for the success of the show. The principal sources of the animals exhibited were the Bureau of Agriculture, College of Agriculture, and private farms.

The following breeds of live stock were represented:

Horses: Arabian, Welsh, and improved native.

Cattle: Indian Nellore, Indo-Chinese, Hereford, Jersey, Ayrshire, Guernsey, and improved native.

Buffalo and Carabao: Indian Buffalo and Native Carabao.

Swine: Berkjala, Berkshire, Poland-China, Duroc-Jersey, and Yorkshire.

Sheep: Shropshire, Native, improved native and Indian.

Goats: Indian, Nubian, and improved native.

Poultry: Chickens: Barred Plymouth Rock, Buff Orpington, Rhode Island Red, Cantonese, Native Pit Games, Light Brahma, Dark Cornish, and Chinese silkies. Ducks: Indian Runner, Pekins. Geese: Toulouse. Turkeys: Bronze. Pigeons: Homer.

The College of Agriculture presented a special live stock exhibit on experiments in animal breeding that had been carried with the aim to find the best proportion of foreign blood to use on Philippine stock to produce improved animals adapted to Philippine conditions. The following animals were exhibited as illustrations of the progress made in these studies:

A. Grading Philippine Cattle with Indian Nellore:
   1. One Indian Nellore bull
   2. One Philippine cow
   3. One grade Nellore steer
   4. One grade Nellore cow
   5. One three-quarters Nellore bull

[1] General contribution from the College of Agriculture No. 188.

B. Grading Philippine Cattle with Hereford:
   1. One Hereford bull
   2. One Philippine cow
   3. One grade Hereford bull
   4. One grade Hereford cow and calf
   5. One three-quarters Hereford heifer

C. Cross breeding Hereford with Indian Nellore:
   1. One Hereford–Nellore bull

D. Grading Philippine Carabaos with Indian Buffalo:
   1. One Indian buffalo bull
   2. One Indian buffalo cow
   3. Two grade Indian buffalo cows

E. The carabao is often dangerous to man and beast with his long horns. Can he be dehorned successfully?
   1. One hornless carabao bullock
   2. One hornless carabao cow

F. Results of crossing Berkshire and Jala-jala Swine:
   1. One Berkjala boar
   2. Two Berkjala sows

This cross is now in its third generation of intensive selection. It is approximately three-quarters Berkshire and one-quarter Jala-jala. It is being kept at this proportion as a higher amount of Berkshire blood seriously affects the hardiness of the cross.

G. Grading up Philippine goats with Nubian:
   1. One Nubian buck
   2. One Philippine doe with 2 grade kids
   3. One grade Indian doe with 2 grade kids

H. Los Baños Improved chickens:
   1. One pen (1 rooster and 4 hens) of selected Cantonese.

Besides the live stock exhibits there were held Civilian Day horse show, Army Day horse show, and Dog and Cat show. Several events were staged on the field and on the track to show the education, training, beauty of form, action and speed of the competing horses.

Many of the College of Agriculture animals were entered in open competition with other animals in the following breeding classes:

1. Beef-work type
2. Beef type
3. Indian Buffalo dairy type
4. Improved native fat type of swine
5. Milch goat type
6. Cantonese chickens.

Blue ribbons were awarded the College entries in cattle in the beef-work type, the beef type, the buffalo dairy-work type; in hogs, in boar class, sow class, and herd class, all Berkjalas; in poultry, the Improved College Cantonese flock. Red ribbons (second place) were awarded beef type and cow class; sow class; two in goats, one buck and one doe. Third

place was awarded in beef type, thus winning all beef prizes. In all, the College entries were awarded seven blue ribbons, five red ribbons, and one yellow. No College animal entered in competition failed to win a prize.

The dehorned carabaos excited considerable curiosity, this being the first public demonstration that the carabao can be dehorned in spite of its large growthy horn.

One result which speaks for the value of the Live Stock Fair was the great demand for the College live stock, particularly our Berkjala hogs for breeding and for feeding purposes. Their merits were recognized when people were given the opportunity to see them.

The one drawback to the fair was the small number of farmers who availed themselves of the opportunity to see this exhibition of our best live stock. More publicity, more practical advertising next year should bring out the farmers and men connected with the agricultural development of our country. One of the most interesting features of the show was that showing how native stock could be improved to suit our particular needs.

Those who attended the fair were men and women intelligently interested in live stock. They were enthusiastic in their praise of the splendid animals and herds shown. Their interest and keen observation were attested by the number of visits they made to the exhibit and by their purchase of animals. It is of interest to note that conspicuous among those who were seen at the fair were many from Batangas, the province well known for live stock. This interest in stock-breeding explains why Batangas leads other provinces in raising fine horses, cattle, and hogs.

The Carnival Association is to be commended for its efforts to help in the development of the country's live stock industry—the backbone of our farming industry. The Association has initiated what is conceded in all progressive agricultural countries to be the most effective stimulus to live stock improvement. It cannot be expected, however, that the Carnival Association without aid will make this a permanent feature in its future activities. A live stock fair should be a permanent institution to be held at suitable regular intervals as the United States State Fairs, the Stock Fairs of Canada, of England, and other European countries. These are the results of the initiative and enterprise of farmers, aided in part by government subsidy.

MARIANO MONDOÑEDO
Of the Department of Animal Husbandry

NOTE: BEEKEEPING, A PROSPECTIVE INDUSTRY IN THE PHILIPPINES[1]

Without question, in certain regions of the Philippines beekeeping can be made a great success. In the mountainous regions of the Islands, wild honey bees of several species are abundant. The largest one (*Apis Binghami*) makes huge pendant cones hanging from the under side of limbs of the largest forest trees, to the size of a bushel basket or more. Honey forms the staple sweet of the wild tribes and is assiduously sought by them, beeswax being a common forest product. These bees are active practically the year round, there being honey producing flowers at all seasons.

One of the most attractive regions that I know of in the Philippine Islands is the province of Bukidnon in north central Mindanao. It is very similar in topography and climate to northern California, as rich and as beautiful and with even a better climate. It is high and cool and with the rainfall very well distributed. In many parts of the Islands the excessive rainfall through the wet season would not be favorable to hived bees. Here at Los Baños, we have five to six feet of rain in six months and at Baguio there is about fifteen feet annually and in many parts of the Islands this sort of thing alternates with a trying dry season. In Bukidnon, these extremes do not exist. Bukidnon promises to be one of the best fruit regions in the Archipelago. Citrus fruits grow there to perfection and I believe that, in the higher parts, some of the standard deciduous fruits will succeed equally well. At present such fruits are imported into the Islands at high cost. It therefore seems entirely possible that the combination of beekeeping and fruit growing will make an ideal one for Bukidnon. Also Bukidnon is a great cattle country and we have every expectation that it will be possible to raise alfalfa there, successfully. If this ever works out practically, the region will be still more attractive.

It seems to me that the greater risk of embarking upon beekeeping in this new country as a sole issue can be avoided by combining it with some other good enterprise like the raising of citrus fruits.

It is to be noted that the native honeys of the Philippines are all highly, characteristically, and very pleasantly flavored. I have not seen any native honey of the unflavored sweet of some of the American commercial honeys. The Philippine product therefore could be put upon the market as something entirely unique and different from other products of the kind.

CHARLES FULLER BAKER
Dean, College of Agriculture.

[1] Experiment Station contribution No. 453.

ABSTRACT[1]

The effect of climate upon the production of corn. PAULINO C. MENOR. (*Thesis presented for graduation*, 1926, *from the College of Agriculture*, No. 253; *Experiment Station contribution, No.* 454).—A detailed study on the relative influence of climatic factors upon the production of corn was carried on in the College of Agriculture from September 28, 1924, to December 22, 1925. Two varieties, the Calauan Yellow Flint, a native variety, and the Mexican June, a foreign variety, were used in this experiment. The climatic factors were rainfall, temperature, wind velocity, evaporation, and insolation.

The objects of the author in this work were as follows: (*a*) to find the part of the year most favorable for planting corn; (*b*) to study the relation of climatic conditions to the production of corn in the College of Agriculture; and (*c*) to find which of the climatic factors under Los Baños has the greatest influence on the production of corn.

Thirteen consecutive plantings were made. At intervals of 28 days the seeds were planted in plots. Only two plants were allowed to grow in each hill. The plants in all plots received the same cultural treatments. The criteria considered in this study were height of the plants, weight of the dry stalks, and weight of grains.

Rainfall was measured by using a rain-gauge in millimeters, temperature by means of a thermograph, evaporation and insolation were obtained by using the black and white atmometers. The white atmometer was used to record the evaporation of the air. The difference between the day reading of the black and white atmometers was used as a measure of insolation. Wind velocity was obtained from the Department of Botany of the College.

The author found that the height of the plants and the dry weight of the stalks on both varieties were closely related with the rainfall. The more rainfall there was the greater the height of the plants and the greater the air-dry weight of the stalk. This relationship holds true in all the cultures, except in January when the rainfall was light. The air-dry weight of the grain according to the author's results had no relation to the rainfall. The heaviest yields of the two varieties were 47.38 grams for Mexican June and 40.59 grams for Calauan Yellow Flint.

The temperature during the months of April and May was high but the production in these two months was very low. Therefore, the temper-

[1] Abstract presented as part of work required in English 6, College of Agriculture.

ature is not a limiting factor in corn production in the College of Agriculture. As to evaporation, the heaviest yields were obtained from the March plantings when evaporation was high. In most of the cultures, insolation and wind velocity apparently bore little relation to the production of grain.

The results obtained may be summarized as follows:

(1) The season most favorable for corn production is when the rainfall is about 312.6 millimeters. (2) Temperature, insolation, and wind velocity had no relation to the production of corn. (3) The best months for planting Calauan Yellow Flint corn were found to be March, December, and January. (4) The best months for planting Mexican June corn were found to be March, September, and June. (5) The month which proved unfavorable to corn production was August when the rainfall reached about 752.7 to 948.4 millimeters. (6) Evaporation influences corn production. Highest yield was obtained when the evaporation was high.

—*Abstract by Mateo D. Jimenez.*

EXTENSION DIVISION NOTES

The sugar industry of some towns of Batangas and Laguna has in recent years been very discouraging. Several *hacenderos* have been almost financially ruined and a great number are now in debt. A few days ago a very wealthy land owner of Lipa, Batangas, had to dispose the greater portion of his land in order to pay a debt of about ₱100,000. The heavy losses of these wealthy men is making the sugar industry in this region very unpopular. Sugar plantations are being so decreased every year that if conditions do not change soon the sugar industry in some towns of this region will be abandoned. There are several factors that are responsible for this decline of the sugar industry. Of course, the great fluctuations in price of sugar in recent years has a great deal to do with the present financial condition of the sugar farmers. Their lack of foresight may not be their fault, but the factors for which they are wholly responsible are the following:

1. They adopted the use of tractors which are sold to them on easy installment plans but the adaptability of which to their condition they had not tried. All lost thousands of pesos in the use of tractors. The debts of most of them were incurred in buying tractors which they found did not give them much benefit.

2. Their production to the hectare is very low and they do not strive to increase it. At present they are getting on an average only 15 tons cane to the hectare and they are content if, at times, they get 20 tons. In Negros a planter is worried if he gets lower than 65 tons.

3. Most of the Batangas sugar cane farmers manage their *haciendas* in a very poor way, giving them little personal attention. They let their farm managers (*catiuala* or capataz) attend to the whole business, going themselves to the fields only during the cutting season, and then for just a few hours.

4. Most of the *hacenderos* are ignorant of modern farming. They do not study their problems. They do not realize the value of things that would improve their farm conditions. They do not want to spend money for fertilizers and modern means that would improve their farms.

The central's agency has conclusively shown that the application of a few kilograms of fertilizer to the Batangas soil increased the production two to three times, yet most of the *hacenderos* are reluctant to apply fertilizer to their land. If the price of sugar does not reach as high as just after the war, which is not probable, and if the Batangas planters do not change their methods the future of the sugar industry in Batangas is very dark.

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The citrus industry, which is considered the most important fruit industry in Batangas, if not in the Philippines, is bound to die out, if the right treatment for the orchards is not discovered. For several years (according to common belief, since the eruption of Taal Volcano in 1911) there has been a considerable decrease of productivity of the trees, and at present they bear fruit very irregularly. No one has been able to explain with certainty the real cause of the decline. Owing to this uncertainty in the behavior of their trees the majority of the growers are getting discouraged, and according to reliable information no one cares to start a new plantation. Coconut is being planted instead of citrus as it is a surer crop.

The Bureau of Agriculture is exerting all efforts to revive the past productiveness of the citrus trees. It has an experiment station in the region where the citrus is most grown. Experiments are being conducted in efforts to find a possible way of bringing back the past productiveness of the Batangas citrus. If the Bureau succeeds in reviving the industry to its former state, it will mean much in prosperity of the province and of the Philippines.

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Feliciano Reveche, B. Agr. '23, who has his home in Sorsogon, capital of the province of the same name, writes the College Extension Agency to the effect that he has under serious consideration a proposal for developing 160 hectares of land, presumably in Sorsogon, to a plantation of coconut and fruit trees in conjunction with a poultry and hog industry. The owner of the land is to furnish the necessary capital to finance the enterprise, and Mr. Reveche is to manage it in the capacity of a partner (*socio industrial*). Mr. Reveche asks for advice to insure the success of the enterprise.

The College Extension Division has recently received a written report from Mr. Leon Katigbak, an *hacendero* in Lipa, Batangas, on the results of the first trial he made with the College Cassava Machine on his farm in Lipa. A free translation of his report from Spanish into English is as follows:

I am sending herewith data on the results of my work in extracting cassava starch and by-products made possible by the use of the College machine which you so kindly loaned to me and for which I am deeply grateful.

My plantation of camoteng cahoy (cassava) was set out in the month of January of last year (1926) and was harvested last February. The land used for this crop was plowed and was not given any further cultivation. The baguio of last November knocked the whole plantation flat to the ground; as a result 80 per cent of the main tubers were uprooted. For this reason only some secondary tubers could be utilized with our present trial of cassava starch making.

For this plantation about 10 per cent of the whole amount of seed used was the variety locally called Balinhoy, rated here as the best variety. The remaining 90 per cent of the seed was collected from wild growth found on the banks of nearby streams; this seed is of unknown varietal identity, we knew them only as wild camoteng cahoy.

Judging by conditions under which I made my first trial, it would be worth while to engage in growing this crop by selecting a good variety and securing a fixed market for the product.

I am having under careful observation the efficiency of the cassava bagasse obtained from extracting the starch as feed for hogs.

Statement of results of starch extraction and expenses in running the College grater.

Total net weight of the tubers peeled and cleaned	3,800 kgm.
Total net weight of starch obtained	581 kgm.
Total net weight of milled bagasse for hog feed	794 kgm.

Expenses incurred.

For pulling the tubers in the field	₱ 51.00
For peeling the tubers	38.00
For milling the cassava and collecting the starch and bagasse	18.40
Total of expenses	₱107.40

Value of the product.

581 kgm. of cassava starch at ₱0.20 a kgm	₱116.20
794 kgm. of cassava bagasse at ₱0.07 a kgm	55.58
Total	₱171.78
Expenses	107.40
Profit	₱ 64.38

Note:

Expenses for fuel in running the motor were not accounted for as the cassava grater as well as the mill for grinding the cassava bagasse were run by belting them to the engine of the sugar mill while the milling of the sugar cane was going on. But had a separate

motor been used for the cassava machine, the expense for fuel would have run to a little more than half a centavo per kilogram of peeled and cleaned tubers.

The production per hectare of the cassava used in this trial was not estimated, due to the fact that the plantation was badly damaged by the strong baguio that devastated Tayabas, Laguna, and Batangas, last November. Besides this, the plantation was not given anything like ordinary cultivation. And the variety used was the wild one found springing up in uncultivated places on river banks.

Under proper cultivation, 15,000 kilograms of cleaned and peeled tuber can very well be obtained from a hectare, if a good variety is used. On this basis and using the figures above indicated the value of the crop would be ₱256.20 per hectare.

The trial as above reported is the first test made by a farmer with the College improved cassava grinder. According to his figures he obtained a little more than 15 per cent extraction. But he is very optimistic about a much better result in his subsequent trials as he feels he can improve conditions in the management of his cassava plantation and in operating the machine. With improved conditions he is expecting to make with the College grinder an extraction of about 20 per cent, comparable to the efficiency of an iron made machine in foreign market. This same cassava grinder when tested on the College ground in 1921 gave an extraction between 23 and 24 per cent of air-dry starch.

One remarkable thing about the latest trial with the grinder by the Lipa farmer is the utilization of the cassava bagasse as a feed for hogs. In our last visit to Lipa to ascertain the results of his trial, the farmer gave us the information that he could sell this bagasse quite readily in the locality at the rate of 10 centavos a kilogram although in his report given here he allowed 3 centavos off as a margin of safety. He did not, however, sell any of the bagasse for he was feeding it himself to his own hogs for observation on its feeding effect.

The grinder in question is being kept on the farmer's *hacienda* in the barrio of Tejiro, Lipa, Batangas, open for inspection upon notice given the *hacienda* owner who resides in Lipa. He will use it as a model for constructing one locally for his own use. "The grinder is made largely of native hard wood, consisting of a revolving drum covered with a sheet of corrugated iron punctured to make a grating surface. This is provided with a set of wooden gears which set the cylinder in motion. Over this a hopper is arranged, the whole resting on a suitable frame. A stream of water plays on this cylinder so as to keep it washed from grated material. After the material is grated, it falls on an oscillating sieve which is set at a slight angle so that the fiber which is left after the starch is washed out falls off the lower end. The starch and water fall through into a trough which has a very

slight pitch so that the current is slow, allowing the starch to settle as the water is drawn off." Both the grating cylinder and the sieve are run at the same time. In the case of the trial made on the College ground a two-horse-power Fairbanks Morse engine was used to run the grinder; but in the trial made by the Lipa *hacendero* the mill was run by belting it to a 25-horse-power engine of a muscovado mill while grinding sugar cane. According to Prof. Harold Cuzner, formerly head of the College Engineering Department, who designed the machine on the principle of a small hand grater, the efficiency depends on having the teeth on the cylinder as fine and sharp as possible. It is highly important in the process of grating that the cassava tubers be applied on the grating cylinder endwise so as to break most of the cells and liberate the starch contained in them.

EXCHANGE NOTES

Nipah in the Philippines and Borneo is definitely seasonal, tapping being confined to six or seven months. It cannot therefore be exploited in these countries except by an indigenous population, who have other work to occupy them during the non-yielding months, or some alternative cultivation for an imported labour force. Nipah in the F. M. S. is not seasonal; tapping can be continued the whole year round.

—*The Planter* (Federated Malay States).

The Premier has announced the Government's intention to inaugurate "Better Farming Train" in New South Wales, with a view to encouraging improved farming methods and greater production. . . . When the train has been equipped it will visit the farming districts, and experts in all branches of agriculture will advise on cultural methods, disease and pest control, packing and preparation for market, the care and management of stock, and other subjects in which the farmer is directly interested. Old methods in agriculture, the Premier points out, must give way to new methods, otherwise production becomes limited to a protected local market, our products being unable to compete in foreign countries where the more scientifically produced goods of our rivals can undersell us. Profitable production is not merely a matter of wages and hours; it is a question of concentration, organization, and up-to-date methods.

The main objective of the train will be to bring the rural communities more directly into touch with the Departments which exist for their welfare. The resources of Departments such as Agriculture, Health, Education, and the Rural Bank have not in the past been fully availed of, for the proper development of the State and the improvement of country conditions, and a feeling has grown up in the minds of our farmers and settlers that they are denied opportunities and assistance which are readily at the disposal of city folk.

—*Agricultural Gazette* (New South Wales).

Honduras has a new banana dehydrating industry started, using a newly invented machine of German origin for the dehydration.

It consists of one dryer, which used either wood or crude petroleum for fuel. The dryer contains 23 hollow plates through which steam passes, heating 175 shelves, holding 60 bananas each. The process is based on the principle of dry heat in a partial vacuum, and takes from 5 to 10 hours, according to the percentage of moisture to be extracted.

The bananas dried by this process are sweet enough to be used as a candy without further treatment. However, it is the plan of the producers to ship the product to the United States and Europe as a prime material in wholesale quantities, to be used as fillers for candies, biscuits, and similar products. The dried product is made from ripe fruit and at the present time the supply is obtained from local plantations.

—*Extension Letter* (University of Hawaii).

Salt was commonly supposed to be a dangerous ingredient of poultry feed. Now it is used and recommended by all practical poultry raisers. It encourages drinking, adds to the palatability of the ration and supplies needed minerals.

Tests recently reported by the University of Illinois show that chickens can be raised on rations containing as high as 8 per cent of salt with no apparent harmful effects. The usual amount of salt mixed with the mash is about one per cent. Fine table salt mixes better with the feed as it is less likely to contain lumps than is coarse barrel salt. Lumps of salt when eaten by chickens often prove fatal.

—*Successful Farming* (Iowa).

Possibly nothing in the way of new discoveries or new methods of transmission has spread with the rapidity of radio. . . .

The great mass of broadcasting stations scattered throughout the length and breadth of this globe makes it possible for the people of every land to have almost continuous entertainment at a nominal cost.

* * *

Nothing, not even the telephone or the automobile, has done as much to bring to the rural homes of the country that entertainment which, before the advent of the radio, was only available to those residing within the corporate limits of our big cities. Therefore we believe its influence on the youth of the rural districts is going to be for the best, particularly if proper supervision prevents the broadcasting of entertainment of questionable character.

—*Cultivator* (California).

COLLEGE AND ALUMNI NOTES

Professor Pontrodonia, horticulturist of the Commonwealth Department of Agriculture, Australia, and located at Melbourne, was on the Campus on May 5. Professor Pontrodonia was *en route* to California, where he expects to spend a year in studying methods of fruit growing. He was greatly impressed with the large College that has been developed here, and was surprised at the relatively small amount of money that has been required—a mere fraction of an appropriation that his department received from the Commonwealth Government for one line of activity alone. He said of our Dean Baker, "If the people of the Philippines realized what he is doing for the country, they would build a monument to him."

A second children's book on Japan by Associate Professor Emma S. Yule has recently appeared. The reader learns of the home life, school life, dress, customs, games, etc., of Japanese children through some forty colored illustrations made from colored photographs, stories, rhymes, and little plays. Artistic in binding, paper, type, and illustrations, as a piece of bookmaking *In Kimono Land* is a credit to the publishers, Rand McNally Company, Chicago.

Dr. F. O. Santos, Associate Professor of Agricultural Chemistry, and member of the Beriberi Control Committee, spent some time in April in Nueva Ecija on field work. He gave a lecture on "Filipino food materials containing beriberi vitamin" before a joint convention of medical inspectors and teachers in Baguio during the Summer Session.

Dr. and Mrs. Felipe T. Adriano arrived on the S. S. *Coblentz* April 30. After receiving his Ph. D. in Cornell University, Doctor Adriano visited different universities of the United States and returned to the Philippines *via* Europe. He returns to the Department of Chemistry as lecturer on Quantitative and Qualitative Chemical Analysis.

The Summer session class in Agronomy V (Survey of Philippine Crops) with Mr. Z. Montemayor in charge visited the Calamba Sugar Estate on May 7. Messrs. Dawis, Medrana, Mercado, and Novero of the Department of Agronomy were also with the party. Both the sugar cane and the coconut plantations on the estate were visited with the purpose of acquaint-

ing the students with the management of these projects. A lecture on operation of sugar cane fields by Mr. H. J. Rothkirch, Assistant Superintendent of the Estate and on coconut plantation operation by Mr. Tacad of the management personnel, gave the students valuable information about the management of these two crops. The copra drier used by the estate was also visited. The party returned to the College greatly impressed with what they had seen.

The College is indebted to the Calamba Sugar Estate authorities for the kindness and help extended these visiting students.

Assistant Professor Cecilio Alincastre gave a twenty-minute lecture on the Sugar Technology Course offered at the College of Agriculture to the audience of the Radio Manila on April 14.

Dr. Elias Pañganiban, Assistant Professor of Chemistry, resigned, effective April 1, 1927. He is now managing a farm in Negros Occidental.

On April 3, the Binacayan Tennis Club, one of the leading tennis clubs of Cavite, visited the Campus and held a very successful all day tournament with the Faculty Tennis Club. Among the players who exhibited exceptional skill in driving and placing were Messrs. Ignacio and Ferre of the Binacayan Tennis Club and Dr. S. A. Francisco, Prof. C. Sulit and Mr. R. Tolentino of the Faculty Tennis Club. Because of the numerous matches scheduled only two sets were allowed each match. The standing of the teams was:

	Won	*Tie*
Faculty Tennis Club	10	2
Binacayan Tennis Club	4	2

Miss Presentación Bersaimin, instructor in mathematics in Manila North High School was a member of the class in the Practical Course in Poultry Husbandry given by Doctor Fronda in the Summer School. Miss Bersaimin plans to make poultry raising one of the projects on her large farm near Bangued, Abra.

Messrs. Severino Etorma and Amado Balagtas, B. S. '27, are graduate assistants in the Department of Agricultural Chemistry. Mr. Etorma is assisting in the investigation on coconut oil and Mr. Balagtas is working in the Experiment Station Food Laboratory.

The U. P. Sugar Mill completed grinding on April 18, having bagged 3,080 kilograms of washed sugar from 62 tons of cane—a recovery nearly 18 per cent more than that of the previous year. The entire operation, including the cane milled outside, brought in a gross profit of about ₱1,000.

The following students completed their practice at the Mill: F. de Jesus, E. Eubanas, G. C. Bermejo, and V. Severino.

Brígido A. Huligañga, member of Class '28, died suddenly on May 6 in Philippine General Hospital after very short illness.

Mr. Huligañga entered the College June, 1924, from San Fernando High School. His scholastic work in College was excellent, the average at close of College year 1927, being 1.96. He had carried extra subjects so that he would have completed the four years' course in three and one-half years. In Military Science his work was of high rank. Last year as Captain of Co. "I," he was awarded Leadership Medal for highest quality of command and leadership. In target practice for same year he ranked first as sharpshooter.

Mr. Huligañga was prominent in College activities; was member and for one semester president of the Mimics and was in cast of two or more plays presented by this club; was member of Junior Agricultural Congress; Chairman, Committee on Social Affairs of Student Body, 1926, and Vice-President, Student Body, 1927; was member of Board of Management of *Philippine Collegian* 1926–1927; and Representative to University Student Council 1926–1927.

Resolution adopted by the Student Body.

Whereas, it has pleased Almighty God to call from our midst to the Great Beyond our highly esteemed College mate, Mr. Brígido A. Huligañga.

Whereas, he was a worthy and valuable member of our College community and a student of ability and painstaking industry, influential in college activities, valuable in shaping our present admirable Student Body Government,

Whereas, by his manly qualities and willing unselfish service he had won the admiration and esteem of the College Community and,

Whereas, his untimely death is a great loss to the Student Body, an irreparable loss to his parents, and deprives the Country of a future citizen of more than usual promise; therefore, be it

Resolved, that the members of the Student Body of the College of Agriculture now in Summer Session express their heart-felt sorrow and sympathy, as they do hereby express, to his bereaved parents, and record their own grief and sense of loss, and be it further,

Resolved, that a copy of this resolution be sent to Brígido A. Huligañga's parents, a copy be sent to The Philippine Agriculturist for publication, and a third copy be filed in the Statute Book of the Student Body Government.

The Committee:

Marcelo B. Peña, *Chairman.*
Manuel B. Villano, *Member.*
Gaudencio A. Ventura, *Member.*

CALLED TO THE GREAT BEYOND

CHARLES FULLER BAKER

Dean College of Agriculture and Director
Experiment Station

July twenty-two, nineteen hundred twenty-seven,
after three weeks illness

"He was an advanced investigator. He sought the truth and he entered the house of truth with open mind, without prejudice or fear. His industry bore constant fruit."

This number of the PHILIPPINE AGRICULTURIST "The College in Retrospect" was in press when Our Dean passed to his final rest. It had been prepared at his special request—his last regarding this publication, in which he ever took a vital interest.

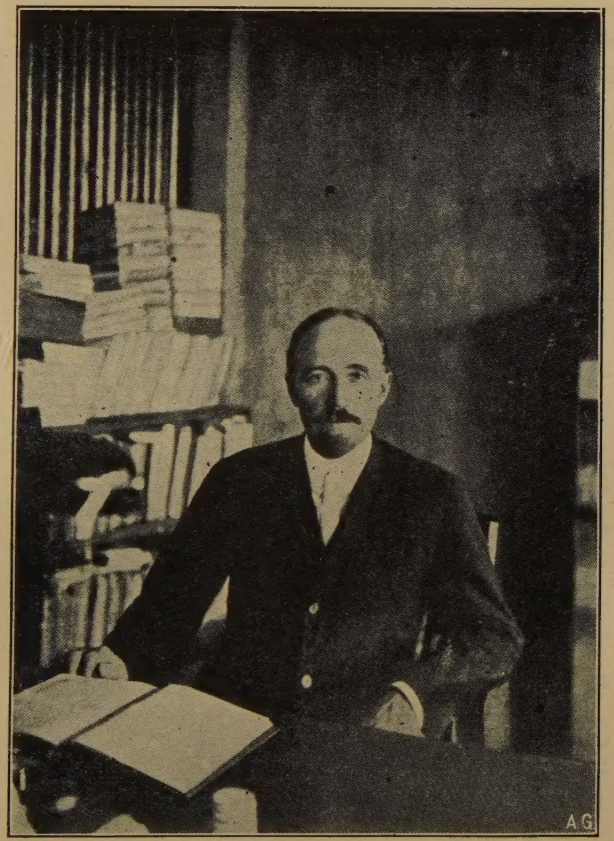
Farmers, as well as other business men, are admonished to take stock periodically. It is well for all of us to take stock occasionally, if not periodically; to pause and turn our minds on days gone by, to spend a brief space in retrospection, recall what manner of men we were a few years since; what our condition, what our aspirations. Then in our stock-taking we may compare, strike a balance. Whether this balance brings a glow of satisfaction or a chill slap of dissatisfaction, it is good for us; the quality of the good depending on the sort of stuff our souls are made of.

Retrospection, stock-taking is good for a college. With this belief this College set apart this number of THE PHILIPPINE AGRICULTURIST to record an informal stock-taking, a little retrospection, some reminiscence, a summing up, a few contrasts. We believe it well for our students to know something of the spirit of the pioneers of ten, fifteen, nearly twenty years ago. We believe it well for these pioneers to spend a little time with memories of other days. They were good days; they were sifting days.

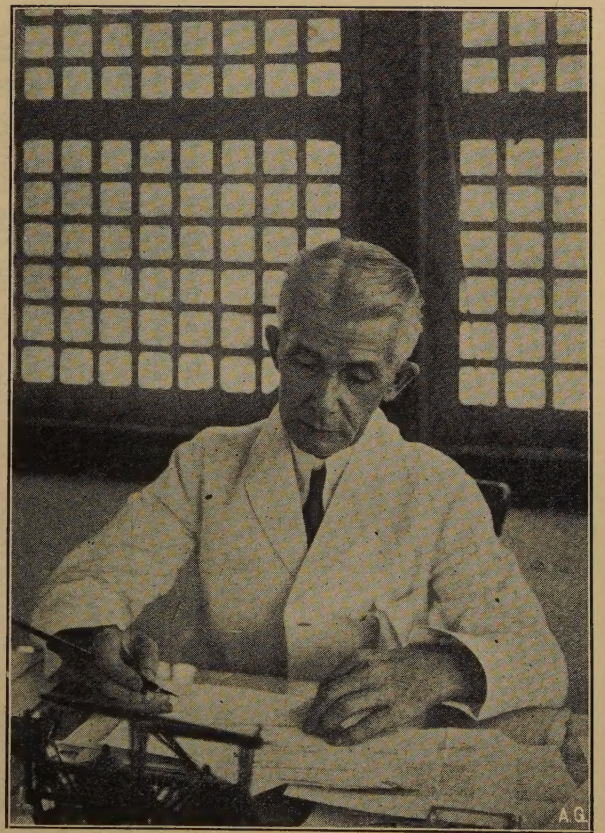
It is well for all, of the early days, of the present days to give their meed of praise, pay their tribute of gratitude to the builders of the College of Agriculture.

It is well for us to pause, to consider, and to answer frankly and honestly the question—"Have we quit ourselves like men?"

E. S. Y.



EDWIN BINGHAM COPELAND
Dean, June 14, 1909,–August 30, 1917



CHARLES FULLER BAKER
Dean, September 27, 1917,–July 22, 1927

OUR TWO DEANS